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**MSc Dissertation**

Financial resilience of British SMEs during the financial crisis of 2008

Student ID number: **29484154**

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This project is entirely the original work of student registration number 29484154. I declare that this dissertation is my own work, and that where material is obtained from published or unpublished works, this has been fully acknowledged in the references. This dissertation may include material of my own work from a research proposal that has been previously submitted for assessment for this programme.

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# Abstract

Access to finance is widely accepted as a top constraint on small firms (SMEs). It limits SMEs’ growth as well as ability to adapt to unexpected events. The financial crisis of 2008 that started with the collapse of Lehman Brothers, a global bank in the USA, brought down the global financial system. In the UK, the incident of the nationalisation of Northern Rock, the multinational fifth largest bank, was a shock to the whole banking system and national economy, from credit crunch to economic downturn and to the sharp rise of corporate insolvency figures. While many SMEs exited, some still survive, which raises a question about the survivors’ financial resilience. What are the financial factors which make a small firm with limited financing sources able to adapt and absorb the crisis? However, financial resilience in small firms is not well and clearly defined from previous studies. The study collects the panel data of 9,998 British SMEs from 2003 to 2012 from the Fame database and selects 17 explanatory variables (8 main variables, 7 crisis variables and 2 control variables) to run Fixed Effects regression using Stata software. While financial resilience, the dependent variable, has binary values, based on Z-score results, most of the other variables are ratios, lagged one-year period, and classified into 3 group factors: bank lending dependence, internal strength and flexibility. The result shows that only flexibility in liquidity management cannot explain financial resilience while other factors can and thus contributes to previous studies about the effect of crisis variables on small firms’ financial resilience.

Keywords: *credit crunch, SMEs, financial resilience, crisis, survival, failure*

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# 1. Introduction

This part talks about the context of the study, research questions, contribution and structure.

## 1.1 Background

SMEs account for 99% of British firms (Champaneri, 2018) and play an important role in contributions to the whole economy. However, SMEs are considered more vulnerable to uncertainty than larger sized firms, (Byrne, Spaliara and Tsoukas, 2016) because of their limitations. Among these disadvantages, access to finance is a key constraint factor for SMEs’ growth and survival, and particularly during the crisis according to Annual Small Business Survey 2007/08 (2009).

The financial crisis 2008 that changed the world was significantly rooted in the failures in the banking system, which caused domino effects on the whole British economy’s activities. 6.4% fall in GDP and 674,000 unemployment are the significant figures for the crisis (Department for Business, Innovation & Skills and HM Treasury, 2013). While SMEs rely on bank lending as the main external financing (Annual Small Business Survey 2007/08, 2009), because they cannot seek funds directly from financial markets by issuing securities, the effect of crisis on them is more serious in the condition of credit crunch. Between 2009 and 2012, 70% of British SMEs failed to apply for bank loans and also did not get any alternative finance (Department for Business, Innovation & Skills and HM Treasury, 2013). Simultaneously, there are some statistics about the death rate of British companies as well as insolvency cases during the crisis, and all of them show that during the crisis, there were increasing numbers of firm closures. Around 27,000 companies liquidated or were declared insolvent only after 6 quarters since the crisis 2008 (Morris, 2009).

However, when the whole economic activity went down, there were still some SMEs who survived, which raises a question about what those survivor SMEs did to adapt and maintain their activities. Hence, the study conducts the research about possible factors contributing to the financial resilience of survivor British SMEs in the crisis 2008. The study uses the financial statements of 9,998 unlisted firms in the UK from 2003 to 2012 to find the answer.

## 1.2 Research Objectives

Financial resilience of British SMEs are considered from three viewpoints: bank lending dependence, internal strength and flexibility, so that an SME can adapt flexibly to uncertainty during the crisis and keep its business running. The objectives are mentioned as below:

**First**, did bank reliance affect the financial resilience of British SMEs during the crisis?

**Second**, did internal strength shown by equity and profitability affect the financial resilience of British SMEs during the crisis?

**Third**, did flexibility measured by liquidity management skills, wide supplier network and financing diversity affect the financial resilience of British SMEs during the crisis?

## 1.3 Contribution and Significance

Financial resilience in SMEs is not a common term in previous studies, thus the study may contribute to the knowledge in this field. In order to do that, the study tests 17 explanatory variables (8 main variables, 7 crisis variables and 2 control variables) to explain the dependent variable - financial resilience. Besides that, the study confirms the results of previous studies about the role of the tested factors in the financial resilience of an SME during crisis. In addition, the study contributes to previous studies with the effect of equity and profitability during the crisis on the financial resilience of British SMEs.

The implications of the study in industry are suggestions to governments and small- and medium-sized businesses so that SMEs can be supported appropriately and actively enhance their financial resilience to improve their survival probability in future financial crises. These suggestions come from the findings of the study.

## 1.4 Dissertation Structure

The study consists of five chapters:

Chapter 1 - Introduction. The chapter describes the context of British SMEs during the crisis 2008, and then raises the issue to be tested and the significances of the study. Finally, it introduces the structure of the dissertation.

Chapter 2 - Literature review. The chapter demonstrates and discusses SMEs and their financing sources, financial crisis and finally builds up hypotheses for factors contributing to the financial resilience of British SME survivors.

Chapter 3 - Methodology. The chapter presents and gives the reasons for the model chosen, measurements for variables, methods and description of the data and sample, as well as the software used.

Chapter 4 - Data analysis. First, the chapter explains the process to get the results, the meaning and significance of the results. Then, it discusses the reasons for the accepted or rejected hypotheses, gives implications and limitations of the study.

Chapter 5 - Conclusion. The final chapter summarises the whole study from the initial issues, the questions which are transformed into the relevant hypotheses and variables from existing theories, the regression results as well as their significance, to the suggestions to industry.

In brief, this chapter introduces the context of the study which leads to three research questions, then mentions the contribution as well as the structure.

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# 2. Literature Review

This chapter is about the context and existing studies for the research objectives. Firstly, an introduction about SMEs and their financing methods is given. Secondly, the study describes the financial crisis of 2008 and SMEs during this time. Thirdly, it shows previous studies and hypotheses for factors affecting financial resilience of survivor SMEs.

## 2.1 SMEs and their financing methods

### 2.1.1 SMEs definition

There are several standards to define SMEs (Small Medium Enterprises). The two most common definitions are American and European standards. According to SBA (Small Business Administration) 2018, American standards focus primarily on size. For most manufacturing and mining industries, a company that has less than 500 employees is considered a small business. But for most non-manufacturing industries, SBA also uses revenue as an SME standard - less than $7.5 million in average annual receipts, with some exceptions depending on the industry. On the other hand, European SMEs need to be qualified in both size and either turnover or balance sheet total according to European recommendation 2003/361. SMEs are companies that do not exceed 250 staff headcount and either €50 million annual turnover or €43 million annual balance sheet total.

**Table 1: SMEs classification in Europe**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Staff headcount** | **Turnover** | **or Balance Sheet Total** |
| Medium | < 250 | ≤ € 50 m | ≤ € 43 m |
| Small | < 50 | ≤ € 10 m | ≤ € 10 m |
| Micro | < 10 | ≤ € 2 m | ≤ € 2 m |

Source: European recommendation 2003/361

The UK, particularly, follows European recommendation 2003/361 with requirements about SMEs in sections 382, 384 and 465 of the Companies Act 2006.

**Table 2: SMEs classification in the UK**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Staff headcount** | **Turnover** | **or Balance Sheet Total** |
| Medium | < 250 | £ 36 Million | £ 18 Million |
| Small | < 50 | £ 10.2 Million | £ 5.1 Million |
| Micro | < 10 | £632,000 | £316,000 |

Source: British sections 382, 384 and 465 of the Companies Act 2006

Besides the two widely used standards above, the World Bank also sets standards for MSMEs (Micro small medium enterprises) on size but some countries have some local modifications.

**Table 3: SMEs classification according to World Bank**

|  |  |
| --- | --- |
| **Category** | **Employees** |
| Medium | 50-249 |
| Small | 10-49 |
| Micro | 1-9 |

Source: World Bank Country Indicators Analysis Note 2010

### 2.1.2 The role of SMEs in the economy

SMEs play an important role in the economy. Neagu (2016) shows that there are two main reasons for the essential role of SMEs. Firstly, SMEs represent the source of entrepreneurship and innovation. Secondly, SMEs generate the majority of job vacancies. Over 99% of enterprises in most economies are SMEs. Lukács (2005) supports the view that SMEs are crucial to the British economy, accounting for 56% of non-government jobs and 52% of turnover, as a backbone of the economy. In Asia, especially in the world’s best performing economies, namely Taiwan and Hong Kong, SMEs are considered the main contributor.

In the changing economic environment, SMEs are flexible and can adapt easily (Savlovschi and Robu, 2011). Nicolescu (2001) agrees that “the entrepreneurial spirit, the intense interpersonal relations, the pronounced group cohesion, the versatility, flexibility and organizational dynamism are defining elements for the economy and the company based on knowledge, which are found traditionally in the small, dynamic companies.”

### 2.1.3 SMEs’ financing methods

SMEs have a characteristic financial structure compared to other types of business. Cressy and Olofsson (1997) compared financial structures of small and large businesses and concluded that there are major differences, especially the reliance on bank funding of SMEs. Hughes (1994) found six points, namely: first, small businesses have lower ratios of fixed assets to total assets than large businesses; second, small businesses have a higher ratio of trade debt to total assets than large businesses; third, small businesses have a much higher ratio of current liabilities to total assets and rely much more on short-term bank loans than large businesses; fourth, to finance investments, small businesses depend heavily on retained profits compared with large businesses; fifth, for additional finance, small businesses obtain it mainly from banks and little from equity compared to large businesses; sixth, small businesses are financially more risky than large businesses as they have relatively high debt to equity ratio and higher failure rates. According to Cressy and Olofsson (1997) and Hughes (1994), small firms rely more highly on bank loans and trade debts than large firms because of their early stage of financial evolution and rely on retained profits to back their debts as a main source of equity.

SMEs have two sources of funding: internal and external funding. By using regression analysis of the BACH database (Bank for the Accounts of Companies Harmonized) of European SMEs between 2000 and 2013, Eisele and Nowak (2017) evaluated the effect of time, sectors and countries on changing values of those sources of funding. Striking features of a capital structure among those sources consist of: equity (38%) that varies mainly across countries and sectors but marginally across time; bank loans (25%) that are stable across time but change significantly across countries and sectors; and bond financing (0.6%) that also fluctuates considerably across countries and sectors. Nassr and Wehinger (2014), who summarized the Financial Roundabout Conference of OECD countries, also mentioned three non-bank financial instruments that would be used to complement bank lending. These financial alternatives are securitization, covered bonds and private placements.

As a small business, SMEs are more vulnerable as they face difficulties in finding external finance compared to large firms. The Small Business Service (2005) reports that around 13% of British SMEs cannot obtain finance from the first source and this depends on their sizes, ages, industries and growth opportunities. Firms with smaller size, younger, proposing growth or working in production and service sectors have more difficulties in obtaining finance. This limits their growth (Cantillo and Wright, 2000; Whited, 1992). Hence, this financial restriction possibly affects SMEs’ contribution to economic growth although SMEs account for the majority of total job creation. Thus, roles of financial institutions as well as innovative financing instruments are very important to help facilitate funding to SMEs even in the case of not well-developed institutions (Beck and Demirguc-Kunt, 2006). In line with that, in Africa, a typical representative of developing countries, according to Kauffmann (2005), SMEs fundamentally depend on the retained earnings and informal savings and loan associations because of little access to external finance when there are inadequate financial facilities and high SMEs’ default risk.

### 2.1.4 The impact of bank funding on SMEs

Bank loans are considered the main source of SMEs’ external financing. Beck et al. (2008) and Stiglitz and Weiss (1981) agree that SMEs depend more on bank finance and become more vulnerable to financing constraints. Mishkin and Eakins (2015) state that in order to raise additional funds, small businesses most often go to banks (Department for Business, Innovation & Skills and HM Treasury, 2013) rather than issue marketable securities as do large and well-established corporations. Voutsinas and Werner (2011) also mention that Japanese small bank-dependent firms which have low total assets rely most heavily on short-term bank loans.

Bank lending affects SMEs significantly. According to the study of Inklaar, Koetter and Noth (2015) about German bank market power before the financial crisis of 2007-2009, banks enhance the regional SMEs’ growth. Also, the credit crunch has had an adverse effect on Japanese economic activities in the 1990s. When banks in Japan were not willing to lend, from 1991 to 2000, the figures for company bankruptcies jumped from 10,723 to nearly 19,000 (Werner, 2005). Also, in a study of approximately 118,000 European SMEs in 20 different countries, Ryan, O’Toole and McCann (2014) show that bank market power worsens financing constraints of SMEs. Specifically, bank market power has a stronger effect on SMEs’ financing constraints in bank-based than in market-based countries. In other words, in countries where there are other alternative financing sources, the firms rely less on bank credit to fund their investment, hence are less affected by bank market power than bank-based economies. This is also proved by Bhaird (2012), namely that SMEs with the highest financial constraints suffer most severely from a credit crunch. However, Kitching and Xheneti (2009) show that not all SMEs suffer heavily from a credit crunch but are able to be resilient in different degrees by adapting to challenges.

## 2.2 Financial crisis

### 2.2.1 Overall picture of financial crisis in 2007-2009 in the UK

The financial crisis 2007-2009 is considered the worst financial crisis since the Depression by the IMF (Stewart, 2008), starting from the housing market and the financial market in the United States, i.e. using advanced financial products such as mortgage-backed assets to finance houses. When the house market slumped in value, the whole global chain was severely affected: mortgage-backed assets’ value decreased significantly, and while banks borrow from each other all around the globe, it led to a collapse globally in financial markets (The Economist, 2013). The Economist Intelligence Unit (2009) reports that there was a globally severe finance rationing, particularly by banks, during the crisis and the economic downturn led to a considerable number of firm exits. 290,000 SMEs in the EU and 150,000 SMEs in the USA went bankrupt in 2009 (McGuinness, Hogan and Powell, 2017).

In the UK, the financial crisis has had a disastrous effect on the whole financial system. It was considered the longest recession period since 1955 (BBC News, 2018). The Great Recession was first caused by the collapse of the fifth largest bank, Northern Rock (Chibber, 2011), in July 2007. In September 2008, the bankruptcy of the American investment bank Lehman Brothers destabilised the global banking system and put the financial market under increasing pressure. In the stock market, the stock price of Halifax Bank of Scotland, the UK’s biggest mortgage provider (Mathiason, 2008), fell steeply after a short time and during this month was bought by Lloyds Bank, which was subsequently renamed as Lloyds Banking Group in January 2009. Bradford and Bingley was part-nationalised and purchased by Santander, a Spanish bank group, in September 2008. In the beginning of October 2008, many parties including the Treasury, Bank of England and Financial Services Authority (FSA) were involved in making a decision to recapitalise financial institutions to avoid the collapse of the whole financial system. £37 billion was given to support three leading banks: Royal Bank of Scotland, Halifax Bank of Scotland and Lloyds TSB and billions were pumped to the UK financial system during the global credit crunch (Treasury, 2012). This financial crisis led to a 6.4% fall in GDP of the whole UK and 674,000 unemployment (Department for Business, Innovation & Skills and HM Treasury, 2013). The amount of lending also declined significantly, from £7.4 billion in 2007 to £3.9 billion in 2009, in terms of net monthly business lending according to Bank of England (2012).

After six consecutive quarters, GDP growth went down since the second quarter of 2008 until the first quarter of 2009 with a total economy shrinkage of 6.4% (BBC News, 2013). In April 2009, the UK was forecast to experience the biggest deficit, £175bn, in history with breathtaking damage to the whole economy because of the financial crisis (BBC News, 2013). Until November 2009, the UK economy showed the first signs of recovery, and GDP grew by 0.1% in the final quarter (BBC News, 2018). In 2011, the country had the highest unemployment at 2.2 million since 1996, household spending was squeezed significantly and some High Street Chains collapsed (BBC News, 2013). In 2012, the new European Central Bank governor claimed the right to use Quantitative easing (printing money) to keep the British economy afloat since the year 2008, deployed by Bank of England (The Independent, 2012).

### 2.2.2 British SMEs during the financial crisis

The financial crisis had a great effect on the performance of the whole UK economy with a total fall of 6.4% in GDP. For SMEs, there was a considerable number of firm exits. In terms of the business birth rate, death rate and net rate between birth and death rate, the figures were significantly changed by the adverse impact of the crisis. Prior to the crisis period, the birth rates for the year 2005 and 2006 were 12.7% and 11.7% respectively while the death rates were 10.6 and 9.5%, hence net rates were 2.1 and 2.2%. During the crisis from 2007 to 2008, there were changes in both the birth rates and death rates, and the net rates were still positive. In 2009 and post crisis 2010, because of the recession, the death rates climbed while the birth rates reduced compared to previous years, leading to negative net rates: -1.9% and -0.6% respectively (Department for Business, Innovation & Skills and HM Treasury, 2013).

**Table 4: Business Birth, Death and Net Rate in the UK**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Birth rate** | **Death rate** | **Net rate** |
| 2005 | 12.7 | 10.6 | 2.1 |
| 2006 | 11.7 | 9.5 | 2.2 |
| 2007 | 12.4 | 10 | 2.4 |
| 2008 | 11.7 | 9.7 | 2 |
| 2009 | 10.2 | 12.1 | -1.9 |
| 2010 | 10.1 | 10.7 | -0.6 |

Source: Office for National Statistics

This problem of SMEs’ bankruptcies is also shown by the figures for workplaces, employees and workplaces in industry sectors.

In terms of the number of workplaces, from Table 5, SMEs in the UK suffered from the recession most significantly from 2009 and started to recover from 2012. At first, the figures for workplaces increased gradually from around 2.1 million to approximately 2.26 million from 2005 to 2008, with the average annual growth rate at 2.4%. However, in 2009 and post crisis periods until 2011, there were some shut-downs, hence the figures declined from about 2.25 million to 2.17 million, with the average decline rate of 1.32%. In 2012, the figure started to rise to 10.98 million.

In terms of the number of employees, from Table 6, the effect of recession was one year later than that of workplaces, shown clearly since 2010. In 2005, SMEs offered around 9.98 million jobs for the whole UK, and the number increased to 10.78 million in 2009, at around 1.97%/year for annual growth rate. From 2010, the figure declined to 10.63 million and then 10.51 in 2011, at around -1.3% per year. In 2012, SMEs started to increase the number of jobs to 10.98 million.

In terms of industry sector, from Table 7, not all the industries suffered from the crisis. While there were some industries affected heavily, some boomed during this period. The most vulnerable industries were administrative and support service activities industries and manufacturing industries. For the whole period from 2007 to 2012, micro firms declined the most in administrative and support services activities industries, 17% per year, while small firms decreased most at 14% per year in manufacturing industry. Similarly, during and post crisis, micro firms and small firms also reduced most in these industries (Inter-Departmental Business Register, 2013).

Credit constraints for SMEs were severe during the crisis, especially in the beginning of 2009. Cowling and Liu (2012) showed that the number of credit-rationed small firms that were denied bank loans peaked after 6 months in February 2009 at 119,000, and then reduced to around 56,000 in December 2009.

**Table 5: Number of workplaces by firm size**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Enterprise size** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| 0 employees | 475,425 | 456,050 | 455,830 | 426,530 | 407,755 | 381,435 | 365,595 | 350,075 |
| 1-9 employees | 1,316,650 | 1,370,730 | 1,423,350 | 1,512,955 | 1,515,920 | 1,493,450 | 1,491,755 | 1,563,845 |
| 10-49 employees | 224,930 | 222,495 | 228,155 | 228,420 | 231,325 | 227,295 | 221,845 | 231,185 |
| 50-249 employees | 87,675 | 91,100 | 90,685 | 90,760 | 90,290 | 91,465 | 91,130 | 92,520 |
| **Total** | **2,104,680** | **2,140,375** | **2,198,020** | **2,258,665** | **2,245,290** | **2,193,645** | **2,170,325** | **2,237,625** |
| **Growth rate** |  | **1.70%** | **2.69%** | **2.76%** | **-0.59%** | **-2.30%** | **-1.06%** | **3.10%** |
| **Average growth rate** | **2.38%** | | | | **-1.32%** | | | |

Source: Office for National Statistics

**Table 6: Number of employees by firm size**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Enterprise size** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| 0 employees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-9 employees | 3,359,800 | 3,464,400 | 3,534,500 | 3,690,100 | 3,759,000 | 3,723,600 | 3,688,800 | 3,865,100 |
| 10-49 employees | 3,483,600 | 3,489,400 | 3,578,800 | 3,605,500 | 3,698,200 | 3,619,000 | 3,520,300 | 3,660,300 |
| 50-249 employees | 3,130,400 | 3,213,700 | 3,233,100 | 3,280,500 | 3,326,100 | 3,287,300 | 3,296,500 | 3,453,000 |
| **Total** | **9,973,800** | **10,167,500** | **10,346,400** | **10,576,100** | **10,783,300** | **10,629,900** | **10,505,600** | **10,978,400** |
| **Growth rate** |  | **1.94%** | **1.76%** | **2.22%** | **1.96%** | **-1.42%** | **-1.17%** | **4.50%** |

Source: Office for National Statistics

**Table 7: Changes in the number of workplaces by industry sector**

|  |  |  |
| --- | --- | --- |
| **Industry** | **Changes** | |
| **2007-2009** | **2007-2012** |
| **Manufacturing** |  |  |
| Micro firms | -2.26% | -8.31% |
| Small firms | -4.96% | -13.51% |
| **Wholesales and motor trades** |  |  |
| Micro firms | -1.40% | -3.59% |
| Small firms | -3.26% | -2.01% |
| **Retail** |  |  |
| Micro firms | -2.27% | -4.86% |
| Small firms | -1.71% | 0.92% |
| **Transportation and Storage** |  |  |
| Micro firms | -0.32% | -6.77% |
| Small firms | 0.26% | 0.17% |
| **Accommodation and Food service activities** |  |  |
| Micro firms | -1.89% | -5.86% |
| Small firms | 1.69% | 6.85% |
| **Financial and Insurance activities** |  |  |
| Micro firms | 9.23% | 10.20% |
| Small firms | -2.15% | 0.32% |
| **Administrative and Support Service Activities** |  |  |
| Micro firms | -9.17% | -16.51% |
| Small firms | -1.40% | -6.56% |
| **Total in all sectors** |  |  |
| Micro firms | 2.37% | 1.85% |
| Small firms | 0.87% | 1.53% |

Source: Inter-Departmental Business Register

## 2.3 Financial resilience of survivor British SMEs

### 2.3.1 Financial resilience

The term resilience is used in diverse fields in which the subjects often endure unexpected events. In general, resilience is defined by how quickly an individual can adapt to unexpected things and by its internal strength that enables it to do that, as described in the study of Windle (2011). Resilience is ‘a process of effectively negotiating, adapting to, managing significant sources of stress or trauma, and assets and resources within the individuals, their life, environment facilitate this capacity for adaptation and bouncing back in the face of adversity’. McDonald (2006) defines resilience as ‘the properties of being able to adapt to the requirements of the environment and being able to manage the environments’ variability’. Bhamra and Burnard (2011) also summarise that the concept of resilience is ‘closely related with the capability and ability of an element to return to a stable state after a disruption…therefore related to both the individual and organisational responses to turbulence and discontinuities.’

In business, the definition of resilience is made by different authors but focuses on flexibility, continuity, and the capacity of a firm. Weick and Sutcliffe (2011) investigated high reliability organisations which succeed in highly risky industries and redefine resilience using the term “agility”, one among the core values that the Baldrige Criteria for Performance Excellence are based upon. They show that, ‘Resilience is a combination of keeping errors small and of improvising workarounds that keep the system functioning… Your organisation is resilient if it can “absorb strain” and keep working, even when things are hard, if it can “bounce back” from crises and if it can learn from them.’ Another famous notion about resilience is from Hamel and Valikangas (2004). They consider that ‘Resilience is the ability to dynamically reinvent business models and strategies as circumstances change… Strategic resilience is not about responding to a onetime crisis. It’s not about rebounding from a setback. It’s about continuously anticipating and adjusting to deep, secular trends that can permanently impair the earning power of a core business. It’s about having the capacity to change before the case for change becomes desperately obvious.’

The Economist Intelligence Unit (2009) shows some evidence about the resilience of SMEs all around the world – they continue to grow during the recession and lead many major economies to grow. There are some key factors contributing to the resilience of SMEs. Generating enough capital for the business is an important factor (Beck and Demirguc-Kunt, 2006; Gunasekaran and Griffin, 2011). When the business owner needs to have more funds to make more investments, it is very difficult to generate capital when the initial personal assets have already been used to start the company, hence it may decide how succesful the companies are. Besides that, the Economist Intelligence Unit (2009) states that SMEs face financial difficulties such as tough credit conditions or cash flow problems (34% of British SMEs), which makes them extremely sensitive to finance supply sources and possibly limits their growth prospects. Ryan and Irvine (2012) measured the financial resilience of an NGO by financial ratios, namely stability, liquidity, gearing and sustainability ratios.

### 2.3.2 British SMEs financing before and during the crisis

Before the crisis, the Small Business Service (2005) report on British SMEs showed that equity finance is not much considered: 89% of small or 92% of micro firms agree with that, but bank loans (54%) and bank overdrafts (22%) are considered the most popular source of finance. Alternative financing sources include leasing (8%), mortgages (7%), grants (6%), loans from Community Development Finance Institution (2%), trade credit (1%) and other methods.

During the crisis, there are controversial opinions about the approach of financing sources of British SMEs. The first opinion is about the role of bank lending in SMEs’ performance. One of the constraints in doing business in the UK is access to finance (The Plan for Growth, 2011), and SMEs have some problems obtaining finance as they have difficulty providing collateral as well as assuring their future success ability to their potential lenders (Department for Business, Innovation & Skills and HM Treasury, 2013). SMEs in the UK got into more difficulties when they sought finance during the financial crisis. The Annual Small Business Survey 2007/08 (2009) reported that in 2005, 79% of SMEs found no difficulties in raising finance from the first financing source but the figures for the year 2006 and 2007 declined to 75% and 73% respectively, while bank financing was still considered the main external finance until February 2008 (44% of SMEs using this method to finance). Similarly, Department for Business, Innovation & Skills and HM Treasury (2013) reported that during the financial crisis 2009-2012, 70% of British SMEs failed to apply for bank loans and also could get no alternative finance, especially in the cases of small and micro firms. However, the second opinion from the Economist Intelligence Unit (2009), in which the report compared SMEs in other economies, showed that British SMEs have been less affected by the credit crunch due to low bank lending reliance but influenced by the declining demand. Only 19% of British SMEs consider the main growth constraint during the crisis to be finance.

### 2.3.3 Determinants of financial resilience of survivor British SMEs

In this study, financial resilience of SMEs is influenced by their dependence on bank lending, flexibility in adapting to changes and internal strength to provide back up for their adaptation. In terms of bank lending dependence, bank loans are considered. In terms of flexibility, there are three sub-factors, namely: financial management skills (measured by cash flow and cash management), business network (measured by trade credit) and diversity of innovative financing sources. In terms of internal strength, equity and profitability (measured by profit margin) are taken into account.

#### A. Bank lending

There are different viewpoints about the role of bank lending in the performance of SMEs. Bank lending in British SMEs consists of bank loans, credit cards and overdrafts. Cosh and Hughes (1994) show that small firms rely more on short-term debt, namely overdrafts and trade credit. Similarly, the Department for Business, Innovation & Skills and HM Treasury (2013) report that bank finance is the most important part in external finance, with over 50% of SMEs preferring bank loans. However, one difficulty faced by SMEs is obtaining bank lending, which restricts SMEs’ growth (Storey, 1994; Winborg and Landström, 2001; Brown et al. 2005). Bank-independent SMEs are more vulnerable to financing constraints (Ryan, O’Toole and McCann, 2014; Beck et al., 2008; Stiglitz and Weiss, 1981) and particularly sensitive to uncertainty (Byrne, Spaliara and Tsoukas, 2016) when the banking system deteriorates (Chava and Purnanandam, 2011). A banking crisis occurred in Japan in 1990s and simultaneously 19,000 companies went bankrupt, rising from 10,723 firms (Werner, 2005). On the contrary, the Economist Intelligence Unit (2009) reports that British SMEs are less affected by credit crunch compared to other countries, only 19% of total SMEs, which is similar to the study of Smallbone, Deakins, Battisti and Kitching (2012). Also, Kitching and Xheneti (2009) state that not all SMEs suffer from credit rationing because they have different degrees of resilience and ability to adapt. Because of contrasting ideas about the role of bank lending in SMEs’ financial resilience during the crisis, the first two-sided hypothesis is:

##### H1. Bank lending affects the financial resilience of British SMEs.

#### B. Equity

In the study of Fraser (2009) about British SMEs between 2001 and 2008, internal equity comes from loans from friends, family members, and business owners as well as cash reserves in deposit accounts. Pecking Order Theory (Myers, 1984) shows that in the condition of information asymmetry, companies prioritise their financial sources: internal financing (or net asset) first, then debts, while external equity financing is the last resort. Ou and Haynes (2004) also state that internal equity is the main financing source for SMEs. Likewise, SMEs would consider internal funding first when they want to seek additional funds (Mateev et al., 2013). The reason possibly is SMEs’ managers, normally also business owners, wanting to avoid ownership dilution (Holmes and Kent, 1991).

From previous research, the viewpoint of internal equity’s positive effect on SMEs’ financial resilience is supported by Smallbone, Deakins, Battisti and Kitching (2012) and Bernstein, Lerner and Mezzanotti (2017). Smallbone and his team (2012) show that around 75% of firms that are unaffected by credit crunch rely on self-financing, while Bernstein (2017) gives evidence that private-equity backed firms increased their investments compared to their peers during the crisis of 2008. However, Zoppa and McMahon (2002) suggest the modified Pecking Order Theory for SMEs with the priority of retained profits as first choice, but new equity capital injections from existing owners as the fourth option, following short- and long-term debt financing as second and third options. British SMEs also do not much value equity as the main funding source, as mentioned above. Hence, from previous research, because the role of internal financing to financial resilience for British SMEs is unclear, the second two-sided hypothesis is:

##### H2. Internal equity affects the financial resilience of British SMEs.

#### C. Financial management skills

Liquidity management is widely agreed to be a key factor for firms’ performance. Deakins et al., (2000) and Sardakis et al., (2007) state that efficient and effective liquidity management is crucial for the growth and survival of small firms. Ekanem (2010) emphasises that learning liquidity management is the key for the survival of firms in the printing and clothing industries. He uses cash management and credit management as the measurements, while Gupta, Wilson, Gregoriou and Healy (2014) and Gentry et al. (1987) use operating cash flow to measure liquidity management capability.

‘Cash is king’ and plays an important role in corporates’ performance. Especially under the pressure of credit crunch and falling demand, SMEs used cash flow and cash management to survive during the crisis. While available cash can help a business handle liquidity issues, a positive cash flow is a signal of how smoothly a firm runs its business and is able to grasp investment opportunities. SMEs in general are not good at cash management after a long period of easy credit before the crisis (Economist Intelligence Unit, 2009), while cash flow management is widely considered to be a factor in corporate bankruptcy forecasting, according to Aziz, Emanuel, and Lawson (1988), Altman, Haldeman and Narayanan (1977), Gombola, Haskins, and Williams (1987). Cash at bank is considered a strong predictor of firms’ resilience (Smallbone, Deakins, Battisti and Kitching, 2012) and the study of organizational resilience of Herbane (2010) shows that SMEs lack cash sources to adapt in economic crises. In terms of operating cash flow, there are contrasting opinions. According to Casey and Bartczack (1985), this measurement cannot provide default information, but Gilbert et al. (1990) states that cash flow variables have explanatory power for a bankruptcy prediction model. Overall, it is unclear the effect of financial management via cash and operating cash flows on British SMEs during the crisis. Hence, the third two-sided hypothesis is:

##### H3a. Cash management affects the financial resilience of British SMEs.

##### H3b. Cash flow management affects the financial resilience of British SMEs.

#### D. Profitability

Earning power, or the ability to make profits, is an important factor in enabling a firm to adapt to difficult situations according to the definition above of Hamel and Valikangas (2004). Aligned with that, Delmar, McKelvie, and Wennberg (2013) state that profitability supports the survival of new firms. The reason possibly is that profitability can help to generate enough capital for the firm’s business (Beck and Demirguc-Kunt 2006). In the same way, the study of Delmar, McKelvie and Wennberg (2013) proves that profitability improves both the survival and growth of new firms, as does the study of Bercovitz and Mitchell (2007) of the relationship of profitability and long-term business survival. Also, lack of profits is considered the main driver of firm mortality (Levinthal, 1991; Carroll and Harrison, 1994). Supporting that, Besanko, Dranove and Shanley (2000) conclude that firms with risk-adjusted rate of return smaller than costs tend to exit the market.

There are several financial ratios for measuring earning power, such as ROA (Return on Assets), ROE (Return on Equity), and ROS. In this study, the profit margin ratio (ROS), the ratio between net income and turnover to measure the cost over the production, is used to test the role of profitability in financial resilience based on some of the following research. Musso and Schiavo (2008) prove that cutting costs is a solution for constrained firms to generate resources without seeking aid from financial markets. Okpara (2011) states that insufficient profits and low demand for products and services are the main constraints on Nigerian SMEs’ growth and survival. Smallbone, Deakins, Battisti and Kitching (2012) give evidence that resilient British SMEs were less likely to reduce selling prices, but instead generated revenues and cut costs during the crisis of 2008. From previous studies, there is a need to do research about the role of profitability on financial resilience of British SMEs.

The fourth two-sided hypothesis is:

##### H4. Profitability affects the financial resilience of British SMEs.

#### E. Business network

A firm with wide business relationships with suppliers tends to take advantage of trade credit, namely, receiving goods and services from suppliers first and then giving back the money within a certain period of time. Trade credit is used in business transactions as another financing source with cheap price (only pay interest when the firm cannot meet the due date). To SMEs, it is considered an important financing source and can supplement short-term bank lending (Demirguc-Kunt and Maksimovic, 2001). For credit-constrained SMEs, trade credit is the main reliance instead of bank loans (Valverde, Fernandez, and Udell, 2012) to meet their financing needs (Carbo-Valverde et al., 2016). In the US, trade credit provides 31.3% of trade credit over total debt compared to 37.2% of bank loans (Berger and Udell, 1998). In Asia, trade credit and supply chain finance are necessary to help promote economic growth (Arzeni and Akamatsu, 2014). In the UK, small firms have more reliance on trade credit than firms in France and Germany (National Audit Office, 2013) because possibly they are significantly less likely to experience negative effects from suppliers compared to New Zealand (Smallbone, Deakins, Battisti and Kitching, 2012). However, in the case of Japan, during the 1990s’ financial crisis, there is little evidence of trade credit’s role.

There are many studies which support this viewpoint about the importance of trade credit on a small firm’s survival. Although trade credit plays an important role on financing, especially during financial crisis, according to the studies of McGuinness, Hogan, and Powell, (2018) and Casey and O'Toole (2014), its financing role in British SMEs is not clear as described in some reports mentioned above. Hence, the fifth two-sided hypothesis is:

##### H5. Business network affects the financial resilience of British SMEs.

#### F. Diversity of innovative financing

Financial flexibility is important for SMEs. Clarke, Cull and Kisunko (2012) show that access to external credit increases the chances of survival during the crisis for companies. The diversification of financing options along with lending efficiency improvement can help SMEs’ access finance more easily, especially in Asia (Cusmano, 2015). Along with that, diversified funding alternatives are necessary for growth-oriented SMEs (Arzeni and Akamatsu, 2014).

There are some innovative tools for financing SMEs, which Cusmano (2015) mentions in OECD report, such as corporate bonds, securitized debt and covered bonds. Hybrid instruments, or mezzanine finance, which are a combination between traditional straight debt and equity are also suggested in this report by OECD. Moreover, crowdfunding or peer-to-peer lending are considered by OECD to have potential to sponsor SMEs. Venture funding is a way to seek external finance that is used in the UK (BIS, 2012). However, according to Cosh and Hughes (1994), SMEs rely on hire purchase and leasing arrangements to a great extent, and alternative forms of debt have limited applicability for SMEs according to Cusmano (2015). As this effect on SMEs’ financial resilience is still controversial, the final two-sided hypothesis is:

##### H6. Diversity of financing methods affects the financial resilience of British SMEs.

In short, the chapter develops a solid theoretical background from previous studies to set hypotheses for research objectives. It mentions SMEs, their financing methods, the context of the financial crisis of 2008, the effect of financial crisis on SMEs, financial resilience, and possible factors affecting the financial resilience of survivor SMEs, with hypotheses.

# 3 Methodology

This section provides the process and reasons for the model selected to test the hypotheses, the measurement of variables, data collection, sample collection and description, and software to analyse the data.

## 3.1 Model

The study is conducted by panel data regression with Fixed Effects model. The reason for panel data regression is to measure the relationship between one given dependent variable - , and one or more other independent variables, in cross sections over time. In this study, in order to measure factors contributing to financial resilience, observations are taken across a set of different firms over the ten-year period of the crisis. According to Baltagi (2008), in contrast to other models which only do cross-sectional or time series regression, the panel data has a double subscript on its variables. The equation of the panel regression model is described below:

Where:

denotes sections such as firms, individuals, households, etc., ranges from 1 to N. It denotes the cross-sectional dimension. In this study, it denotes SMEs.

denotes time, ranges from 1 to N. It denotes the time-series dimension.

is dependent variable. In this study, Y is financial resilience.

is scalar or constant.

is K x 1 or coefficients of independent (explanatory) variables.

is the observation on K explanatory variables. In the study, there are two types of these variables: control variables and main explanatory variables.

is error term. It is important in this model and consists of two components: for time-invariant unobservable variables (factors not included in the regression) and for the remainder disturbance:

There are three types of panel data regression: Fixed Effects model, Random Effects model and Pooled OLS. After using Durbin–Wu–Hausman test and Breusch-Pagan Lagrange multiplier (LM) test and performing Fixed Effects regression, Fixed Effects model is selected; and the process is described in Chapter 4 – Data analysis. Allison (2009) states that in Fixed Effects model, varies across individuals (in this study, individuals are SME firms), not over time, while is different for both individuals and time periods. Allison (2005) mentions two key requirements to apply this model: each individual must have at least two measurements on the same dependent variable and the values of the independent variables must be different on at least two occasions. The study meets the two requirements as there are 17 variables for financial resilience and the values of these variables vary across 10 years.

Unobserved variables can produce bias in the estimates, hence Fixed Effects model can help control them. Fixed Effects model has the assumption that there are no changes in unobserved factors over time within each firm in order to remove omitted variable bias, or to hold the fourth assumption of OLS regression model among totally five assumptions, which is mentioned below (Allison, 2005):

(4) Cov(ui, Xt) = 0 or Error term and corresponding Xs have no relationship.

There are several limitations of Fixed Effects model. First, it focuses only on the within-person variation but neglects the between-person variation. Second, when it is applied to non-experimental data, this leads to an increase in sampling variability, compared to other methods. Last but not least, the most crucial limitation is when the ratio of within- to between-person variance is 0, it cannot estimate the coefficients for variables that have zero within-subject variation.

## 3.2 Variable measurements

To test these hypotheses, it is necessary to clarify the variables. The dependent variable is financial resilience, and is explained by 17 independent variables including 8 main variables, 7 crisis variables and 2 control variables.

### 3.2.1 Financial resilience

As there is no definition or measurement of financial resilience of an SME from previous research, financial resilience is considered as the survival or failure probability or vulnerability of a firm. The Z-score model of Altman (1993) which is used to make corporate bankruptcy prediction is applied to set up a cut-off and then the dependent variable is given a binary choice. There are three types of Z-score model, in terms of firm characteristics, namely publicly traded manufacturing firms, non-manufacturing and emerging market firms, and private firms. The adjusted Z-score model for private firms is below (Altman, 2000):

Z = 3.107 + 0.717 + 0.998

+ 0.42 + 0.847

Then, Altman uses the Z-score to classify the firms into different areas:

* If Z < 1.23, the firm has 95% probabilities of bankruptcy within one year
* 1.23 ≤ Z ≤ 2.9, the firm is in grey area, or zone of ignorance, or misclassified by this model
* Z > 2.9, the firm is classified as non-bankrupt

Financial resilience has binary values: 0 and 1. If a firm has Z-score less than the cut-off (1.23), its financial resilience equals to 0, or the firm does not have financial resilience to survive and 1 otherwise. The Z-score process to find this value is similar with the study of McGuiness (2018) for the measurement of financial distress variable, but in opposite direction.

### 3.2.2 Bank lending

According to the studies mentioned in Literature Review, British SMEs depend greatly on bank loans. In this study, the effect of credit crunch from banks to the firm’s survival is measured by the dependence ratio of bank lending, or the total amount of short-term loan overdraft and bank overdraft over total assets collected from Balance Sheet.

Bank lending = (Short-term loan overdraft + Bank overdraft)/Total assets

### 3.2.3 Internal equity strength

To measure the internal equity strength, the ratio of total equity over total assets collected from Balance Sheet is used. The trade-off theory of capital structure of a firm shows that internal equity and debt are main financing sources, hence there is a trade-off between them when making a financing decision (Brealey, 2012). Therefore, as every firm has different characteristics, its target debt ratio which is total debt over total assets varies or internal equity ratio fluctuates. According to him, safe companies with plenty of tangible assets and taxable income would rely more heavily on debt than unprofitable, risky firms with intangible assets that would depend on equity.

Internal equity power = Net asset/Total assets

### 3.2.4 Financial management skills

To measure the financial management skills of SMEs’ business owners, there are two ratios which need to be considered: operating cash flow ratio and total cash over sales ratio. In order to evaluate how quickly the business owners can manage their financial status in an economic downturn, cash flow and cash management are among common methods. Hillier (2013) emphasises the role of cash flow for a business: If a firm cannot generate enough cash flows to meet their payments, it will suffer from financial distress which may lead to an asset liquidation or insolvency. The variable for the efficiency of cash flow management is defined by operating cash flow ratio collected from Cash flow statement and Income Statement:

Operating cash flow ratio = Cash flows from operations/Total liabilities

In terms of cash management, the variable is the ratio of cash over sales, in order to measure how much cash a firm can collect from the real turnover which is different with accounting turnover. Some customers make late payments or do not pay and this money becomes bad debts while during financial turmoil, cash plays an important role in maintaining a business. In this study, due to insufficient information, cash is measured by increase (decrease) cash in the end of period collected from Cash flow statement.

Cash/Sales = Final increase (decrease) cash/Turnover

### 3.2.5 Profitability

To measure the profitability, the profit margin ratio or ROS (Return over Sales) is the corresponding variable. The values for this ratio are collected from Income Statement. This ratio helps find how much expenditure a firm needs to make turnover, when cost reduction is a common method for corporates during the crisis (Economist Intelligence Unit, 2009). Brealey (2012) analyses ROS, which contributes to ROE (Return over Equity) as below:

ROS = Net income/Turnover

### 3.2.6 Wide business network

Gianneti, Burkart, and Ellingsen (2011) find out that trading relationships are important to understand trade credit when suppliers consider financing the firms with financial difficulties. Also, they discover that firms that are more creditworthy and have buyer market power can easily get discounts at trade credit. In the study of McGuiness (2018), he mentions the role of trade credit to financially constrained European SMEs during the financial crisis 2007-2009. The values for this ratio are collected from Balance Sheet.

Trade credit = Trade credit/Total Assets

### 3.2.7 Financing Diversity

To measure the diversity of financing resources, the variable of other financing sources is used. On Balance Sheet, innovative financing sources are considered as the sum of Group loan, Hire purchasing and liabilities and Other loans in both short- and long-term funding. The formula for this variable is shown as below:

Diverse financing methods = Total innovative financing sources/Total assets

The independent variables lag one period compared to the dependent variable with the assumption that the explanatory variables would have an effect on the main dependent variables after one–year period. According to Gollob and Reichardt (1987), in causality relationship, a cause needs to take time to see the effects on the affected subject. Hence, the study is based on this lagged time effect to concentrate on the contributions of main factors on financial resilience. Besides that, the dummy variable *time* with the intention of time crisis is used with binary values: 1 for the year from 2008 to 2012 and 0 for prior crisis, so that crisis variables are based on *time* and their original variables to calculate their crisis values. Crisis variables = time (crisis) \* original variables. Control variables are *size* and *growth* without lagged time, because the study does not want to focus on them.

##### In summary, the equation for the study is below and the variable measurements are displayed in Table 8.

The variable measurements have a limitation, that is, the capital structure ratios are used with the same denominator, total assets, but with different aspects to explain the effect on financial resilience.

**Table 8: Variable measurements**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Variables** | **Functions** | **Measurements** |
| 1 | Financial resilience | Dependent variable | 1 (if Z-score >= 1.23) and |
| 0 (if Z-score < 1.23) |
| 2 | Bank lending | Main variable | Bank loans/Total assets |
| 3 | Equity | Main variable | Equity/Total assets |
| 4 | Cash flow | Main variable | Operating cash flow/Total liabilities |
| 5 | Cash | Main variable | Cash/Turnover |
| 6 | Profitability | Main variable | ROS or Net income/Turnover |
| 7 | Business network | Main variable | Trade credit/Total assets |
| 8 | Diversity financing | Main variable | Other financing methods/Total assets |
| 9 | Time | Main variable | 1 (if year >= 2008) and |
| 0 (if year < 2008) |
| 10 | Credit crunch | Crisis variable | Time \* Bank lending |
| 11 | Crisis equity | Crisis variable | Time \* Internal equity |
| 12 | Crisis cash flow | Crisis variable | Time \* Cash flow |
| 13 | Crisis cash | Crisis variable | Time \* Cash |
| 14 | Crisis profitability | Crisis variable | Time \* Profitability |
| 15 | Crisis business network | Crisis variable | Time \* Business network |
| 16 | Crisis financing diversity | Crisis variable | Time \* Financing diversity |
| 17 | Growth | Control variable | (Sales it-1 - Sales it)/Sales it-1 |
| 18 | Size | Control variable | Size |

## 3.3 Data collection

The data are secondary data from the financial statements of British SMEs from 2003 to 2012. There are three time periods to be considered namely pre-crisis period from 2003 to 2007, during- and post-crisis period from 2008 to 2012. The reason for time period classification is to analyse the differences between the effects of explanatory variables on financial resilience with time crisis. The study considers the stability of these firms using some variables measured in pre-crisis period and the adaptation from the most severe period – during-crisis period until the crisis finished in 2012. The time scale follows that of the study of McGuinness (2018).

Data are collected via Fame database which offers access to Bureau Van Dijk, a company that is expert in private firm information. The data are displayed as panel data in order to measure the financial resilience of different companies by different variables over time. Panel data, also known as longitudinal data or cross-sectional time series data, contain observations of a range of companies on multiple variables over multiple periods of time. Finkel (1995) defines panel data as a type of data that gathers information from the same individuals or units over time to test theories of individual or social change. Individual changes in a set of variables are directly measured because in the design, the change is included explicitly. The differences between time series and panel data are shown by some studies. Markus (1979) concludes that in a time series data, observations are taken on a single entity over relatively large time periods, while in a panel data, observations are on many entities but at relatively smaller time scale. Also, Obstrom (1978) states that the unit of analysis in time series is the time point, whereas in panel data the unit is the individual.

The study selects some constraints to take data from Fame, namely the definition of SMEs, location, major industry classification, and stock data. The definition of SMEs in terms of number of employees and amount of turnover according to the British Companies Act 2006 is used to select firms that meet these constraints in the year 2008. The study cannot use the data before 2008 because Fame now does not allow selection of search criteria more than last 10 years. Besides that, the firms need to be located inside the UK, work in major industry sectors, excluding bank, insurance and public administration sectors, and be still unlisted currently. Under these constraints, there are 43,548 British private unlisted firms in the UK to be found.

## 3.4 Sample collection and description

There are 9,998 companies selected as a sample for this study, which represents 23% of the population. During a ten-year period, there are 99,980 initial observations. The reasons are limited time and Excel performance when computers deal with a large number of observations.

These companies are randomly selected, varying in different sizes, locations, and major industries. In order to do statistics with these firms, they first need to satisfy a Z-score calculation, that is to say their Z-score results should not be errors. After this step, the number of companies as well as observations does not reach the ideal number of 99,980, but fluctuates over the period because in each year there are some companies which do not have enough data to calculate Z-score. In terms of size, most firms observed are medium companies (62%), then small (26%) and micro firms (12%) showed at Table 9. These sample companies are classified by the number of employees but not by the amount of annual turnover, following the annual report Business Statistics of Department for Business, Innovation and Skills, because some firms cannot be classified with both conditions, which is a limitation of the study. In term of location at Table 10, among England, Scotland, Northern Ireland and Wales, England dominates the observations with 91%. In term of industry sector, Other services, Wholesale and retail trade, and Machinery, equipment, furniture, recycling industries account for the majority of the observations, with 34%, 20% and 11% respectively, within 16 major industries after excluding Bank, Insurance, and Public companies, see Appendix I page I1.

**Table 9: Firm size classification**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Size** | **Micro** | **Small** | **Medium** | **Total** | **Micro** | **Small** | **Medium** | **Total** |
| 2003 | 1,561 | 2,254 | 4,397 | 8,212 | 19% | 27% | 54% | 100% |
| 2004 | 1,761 | 2,156 | 4,658 | 8,575 | 21% | 25% | 54% | 100% |
| 2005 | 1,731 | 2,247 | 4,966 | 8,944 | 19% | 25% | 56% | 100% |
| 2006 | 1,555 | 2,401 | 5,318 | 9,274 | 17% | 26% | 57% | 100% |
| 2007 | 1,201 | 2,586 | 5,823 | 9,610 | 12% | 27% | 61% | 100% |
| 2008 | 698 | 2,808 | 6,414 | 9,920 | 7% | 28% | 65% | 100% |
| 2009 | 686 | 2,668 | 6,278 | 9,632 | 7% | 28% | 65% | 100% |
| 2010 | 689 | 2,516 | 6,267 | 9,472 | 7% | 27% | 66% | 100% |
| 2011 | 674 | 2,345 | 6,302 | 9,321 | 7% | 25% | 68% | 100% |
| 2012 | 632 | 2,220 | 6,296 | 9,148 | 7% | 24% | 69% | 100% |
| **Total** | **11,188** | **24,201** | **56,719** | **92,108** | **12%** | **26%** | **62%** | **100%** |

Source: Fame

**Table 10: Location classifications of SMEs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location** | **England** | **Scotland** | **Wales** | **Northern Ireland** | **Total** |
| 2003 | 7,502 | 415 | 194 | 101 | **8,212** |
| 2004 | 7,833 | 436 | 200 | 106 | **8,575** |
| 2005 | 8,178 | 449 | 208 | 109 | **8,944** |
| 2006 | 8,477 | 468 | 212 | 117 | **9,274** |
| 2007 | 8,788 | 483 | 219 | 120 | **9,610** |
| 2008 | 9,073 | 501 | 221 | 125 | **9,920** |
| 2009 | 8,816 | 474 | 220 | 122 | **9,632** |
| 2010 | 8,668 | 472 | 215 | 117 | **9,472** |
| 2011 | 8,525 | 465 | 215 | 116 | **9,321** |
| 2012 | 8,358 | 457 | 215 | 118 | **9,148** |
| **Total** | **84,218** | **4,620** | **2,119** | **1,151** | **92,108** |
| **%** | **91%** | **5%** | **2%** | **1%** | **100%** |

Source: Fame

## 3.5 Software

Data are analysed by using Stata version 15.0. Stata is a statistics software created in 1985 for data management, data analysis, and to make graphs. The study uses Stata software to detect outliers, do tests and run regression.

To summarise, this chapter introduced the Fixed Effects model for panel data regression which is applied to the dataset of around 10,000 British SMEs in the crisis of 2008. Financial resilience has binary values via Z-score while explanatory variables are mostly ratios and divided into three sub-groups.

# 4 Data analysis

This chapter first starts with outlier detection, data statistics description, tests to select appropriate model, result interpretation and discussion, then suggests some implications and further research approaches from the study’s limitations.

## 4.1 Cleaning data and removal of the outliers

First the study uses the filter function in Excel to remove some observations that have erroneous values in terms of variables. Because most of the variables are ratios and many companies have many missing values in their financial statements, some ratios for all relevant variables have errors and thus are taken out from the data. The exception is observations in the year 2003, which are normally kept, because the lagged variables need to be calculated one year before the year the variables are in, and there are no values for the year 2002, as the data started in 2003. After this step, there are 83,364 observations left.

Then with the skipeplot and graph box command in Stata, the study removes some outliers from collected data which have some unusual values and are isolated from other variables according to each independent variable. The unusual values are selected by observing the graph distribution and the value standard of some variables. In terms of *growth*, there are 28 outliers which are located far from other observations larger than 400 and smaller than -100. In term of *bank lending*, 11 outliers are detected which do not follow the distribution pattern of other variables, as their values are larger than 27. Along with that, *equity* has 8 outliers which have values less than -40; *cash flow* has 6 outliers smaller than -100 and larger than 3,000; *cash* has 9 outliers which have values larger than 1000 and less than -100; *business network* has 3 outliers which have values larger than 2; and *diversity financing* has 10 outliers which have values larger than 40 and less than -20. In total, there are 42 outliers which were taken out from the data. The study does not remove some unusual numbers if they still follow the distribution.

## 4.2 Data description

Using the summarize command in Stata, displayed in Appendix II page II2, each variable has some statistical characteristics, namely mean, Standard deviation (Std. Dev.), min value, max value and the number of observations. There are some striking features in the data. First, the observations of each variable are different, as some variables have more error values than others. Second, the means of most variables are less than 1 because they are ratios, and are positive, except the control variable *size* (6.99) and the crisis variable *crisis cash* (-0.008). Third, the crisis value *crisis cash* varies significantly, with a Standard deviation of 15.07, as does the control variable *growth* at 5.37, while most of the other variables vary marginally. The crisis time makes the corresponding variables change their Standard deviations: most decrease their fluctuation, except *crisis cash*. Fourth, combined with the graphs above, obvious right-skewed distributions are dependent variable *Y*, *size*, *equity*, while most of the other variables have left-skewed distributions. Fifth, control variable *growth* has least observations at 75,124 while dependent variable *Y* and some crisis values maintain the highest observations at 83,364. The reason is that *growth* observations lack the value for 2003 when the data started in 2003, not in 2002.

## 4.3 Model tests

The model used is the Fixed Effects model. This was because of three tests’ performances: LM test, Hausman test and Regression were used to select the best model among Fixed Effects, Random Effects and Pooled OLS models. First, to compare between Random Effects model and Pooled OLS model, Breusch and Pagan Lagrangian multiplier test (LM test), with xttest0 command in Stata, is considered with the hypothesis as below:

##### H0: Pooled OLS model is better than Random Effects model

P-value of chibar2 is 0, or the null hypothesis is significantly rejected. Thus, Random Effects model is better than Pooled OLS in this study.

Second, to compare between Fixed Effects model and Random Effects model, Hausman test with Hausman command inStata is run, with the hypothesis as below:

##### H0: Random Effects model is better than Fixed Effects model

P-value of chi2 is 0, which shows that the null hypothesis is significantly rejected. Hence, the Fixed Effects model is better than the Random Effects model.

Third, to compare between Fixed Effects model and Pooled OLS model, the Regression with xtreg, fe commandin Stata is run, with the hypothesis below:

##### H0: Pooled OLS model is better than Fixed Effects model

P-value of F-test is 0, which shows that the null hypothesis is significantly rejected. The Fixed Effects model is better than the Pooled OLS model.

From all the tests, the Fixed Effects model is chosen.

Test’ results are displayed in Appendix III page III1.

## 4.4 Interpretation of results

The regression, displayed in Appendix III page III3, shows that the model has the power to explain the effect of independent and control variables on dependent variable – Y or financial resilience. However, some variables cannot explain the dependent variable. Also, the observations are smaller than the modified observations.

### 4.4.1 General results

The model is significant in explaining financial resilience’s variation. To test the explanatory power of the whole model, Stata used the F-test with the hypothesis as below:

H0: All coefficients of the variables are zero

H1: All coefficients of the variables are different from zero

The P-value of F-test is 0, which is smaller than any significance level: 1%, 5% or 10%. This strongly rejects the null hypothesis, and the model fits well enough to explain the dependent variable financial resilience.

The goodness of fit of the model is displayed by three R square. The within R-square is 1.77%, overall R square is 18.65%, and between R square is 33.43%. Overall, the model can explain financial resilience’s variation at 18.65%, or the data fits with the model at around 19% to explain the dependent variable.

The study used control variables, main independent variables and their crisis variables. Control variables *size and growth* are tested with t-test, and only *size* is able to explain the dependent variable financial resilience. Most of the main independent variables can explain the dependent variable, except *cash flow*. While variable *time* for time crisis has a positive impact on financial resilience, most of the crisis variables cannot explain it.

In each variable, there are different significant explanatory powers. In terms of p-value of t-test, in any significance level 1%, 5%, or 10%, some variables cannot explain the dependent variables, namely *growth, credit crunch, cash flow* and its crisis variable, *crisis cash, crisis business network* and *crisis financing diversity*. The hypothesis of each variable is displayed below:

H0: the coefficient of the variable is zero

H1: the coefficient of the variable is different from zero

Also, in terms of coefficient, explanatory variables have both negative and positive effects on dependent variable Y. The negative influence on financial resilience is caused by the control variable *size*,the independent variable *bank lending* and crisis variable *crisis equity*. Among all explanatory variables, *cash* has the most marginal impact on financial resilience, while *business network* and *profitability* can explain most. The constant value of the model is around 1.12, which shows that when all explanatory variables are zero, financial resilience still has the value of 1.12.

In addition, the model has correlation between fixed-effect errors (ui) and other time-varying regressors (Xit) at 0.4. The intraclass correlation, rho, shows that around 60% of the variance in financial resilience is because of differences between u\_i. The correlation matrix via the *Correlate* command inStata,displayed at Appendix IV at page IV1*,* shows that among explanatory variables, there are some variables strongly correlated with each other. First, main independent variables are correlated with their crisis variables because crisis variables’ values are the multiple of time crisis (binary values) and their original variables. Second, some variables relate to liabilities, such as *bank lending, equity, financing diversity,* because their ratios come from the same root, total assets, so they are correlated to each other. However, these variables still satisfy the Fixed Effects model because Stata shows that there are no omitted variables in the regression.

### 4.4.2 Hypothesis testing

For each hypothesis, according to its p-value of t-test and coefficient, it is rejected or accepted.

##### H1. Bank loans affect the financial resilience of British SMEs.

The variables to measure bank loans are *bank lending*, the lagged ratio of bank loans over total assets, and its crisis variable *credit crunch.* The main variable *bank lending* has a robust effect on financial resilience when its p-value is 0, so H1 is strongly accepted, but the crisis variable has p-value 0.431, which is larger than any significance level, so it is omitted.

Bank loans have a negative effect on financial resilience, because its coefficient is negative at -0.042. In other words, when the ratio of bank loans over assets this year is reduced, then next year a firm has more financial resilience.

##### H2. Internal equity affects the financial resilience of British SMEs.

The variables to measure internal equity power are *equity*, the lagged ratio of net assets over total assets, and its crisis variable *crisis equity.* Both variables have robust effects on financial resilience with p-values of 0.001 and 0, respectively, so H2 is strongly accepted.

In general, equity has a positive effect on financial resilience, because its coefficient is positive at 0.021; but during the crisis, equity has a negative influence, with its coefficient at around -0.025. In other words, usually when the ratio of equity over assets this year is increased, then next year a firm has more financial resilience, but it has an opposite effect when crisis occurs.

##### H3. Financial management skills affect the financial resilience of British SMEs.

Four variables to measure financial management skills are *cash flow*, the lagged ratio of net operating cash flow over total debts, its crisis variable *crisis cash flow*, and *cash*, the lagged ratio of increased (decreased) cash at the end of the financial year over turnover, and its crisis variable *crisis cash.* All of these variables have p-values of 0.812, 0.289, 0.369 and 0.504 respectively, which are larger than any significance level, so both H3a and H3b are strongly rejected.

##### H4. Profitability affects the financial resilience of British SMEs.

The variables to measure profitability are *profitability*, the lagged ROS, a ratio of net income over turnover, and its crisis variable *crisis profitability.* Both variables have a robust effect on financial resilience, with their p-value at 0, so H4 is significantly accepted.

Profitability plays a positive role in explaining financial resilience, because their coefficients are positive at 0.057 and 0.036, respectively. When ROS this year is increased, then next year a firm has more financial resilience.

##### H5. Business network affects the financial resilience of British SMEs.

The variables to measure wide business network are *business network*, the lagged ratio of trade credit over assets, and its crisis variable *crisis business network.* Only *business network* has a robust effect on financial resilience, with its p-value at 0, so H5 is significantly accepted. The crisis variable has p-value at 0.444, which is higher than any significance level, so it is omitted.

Trade credit strongly affects positively financial resilience, because its coefficients are positive at 0.086. When the ratio of trade credit over total assets this year is increased, then next year a firm has more financial resilience.

##### H6. Diversity of financing methods affect the financial resilience of British SMEs.

The variables to measure financing diversity are *diversity financing*, the lagged ratio of other financing methods over total assets, and its crisis variable *crisis financing diversity.* Similar with other hypotheses, only *diversity financing* has a robust effect on financial resilience, with its p-value at 0, so H6 is strongly accepted. The crisis variable is omitted because its p-value is 0.259, higher than any significance level.

Financing diversity affects positively financial resilience, because its coefficient is positive at 0.02. When the ratio of total other financing methods over total assets this year is increased, then next year a firm has more financial resilience.

## 4.5 Discussion

The findings from this study suggest that the financial resilience of SMEs may be influenced by their reliance on bank lending, flexibility from external sources and relationships to adapt to changes and internal strength from equity and profitability to provide backup for their adaptation. The observed variables are able to explain 19% of financial resilience in the case of survivor SMEs in the UK during the financial crisis of 2008.

There was no evidence of a statistically significant effect of financial management skills (H3) on the financial resilience of small firms due to the p-value. Nonetheless, there was a pronounced trend of SMEs to have better financial resilience if they have a wide supplier network: to more flexibly generate capital (H5); have higher profitability (H4); be less dependent on bank loans (H1); have more diverse sources of financing (H6); and have more internal equity (H2) regarding the value of their coefficients. Besides that, some other factors, namely firm size, crisis time (dummy variable) and growth, have an effect on financial resilience: while crisis time and growth have positive impact, firm size has negative influence.

In addition to p-values and coefficients, data and statistics characteristics of these variables provide reasons to reject or accept the hypotheses. In terms of data, H3 is rejected because of the insufficient data of operating cash flow and increase (decrease) cash in Cash flow statement that Fame offered. Among the collected financial statements, Cash flow statement lacks information the most. The reason possibly comes from the accounting standards for SMEs in making financial reports. Since 1 January 2012, SMEs need to switch from UK GAAP (Generally Accepted Accounting Practice in the UK) standard to IFRS (International Financial Reporting Standards), with the exception of firms with less than 50 staff and either total assets less than £3.26m or turnover less than £6.5m (Fsn.co.uk, 2010). IFRS requires that SMEs must have a cash flow statement, while in UK GAAP, this is not compulsory (AccountingWEB, 2010). According to the study of Sian and Roberts (2009), IFRS aims at larger companies in capital markets, thus the standards are not really appropriate to SMEs, and possibly causes difficulties for SMEs in making financial statements. Also, as the data was collected from 2003 to 2012, the transition possibly leads to the shortage of information in Cash flow statements of SMEs, especially in small and micro firms. Hence, the ratios of cash flow and cash management have error values and then are replaced by blanks or zeros which cannot contribute to explaining the regression. The same reasoning is applied to some rejected crisis variables. Because crisis time has only two values 0 and 1, so crisis values have many zeros after the original variables multiplied with crisis time 0. And also, many zeros cannot help to explain the regression for crisis variables, whereas the observations of crisis variables are at the full capacity, at 83,364, larger sample size than original variables. The sparse distribution with many zeros possibly causes the low p-values. Two exceptions for crisis variables are *crisis equity* and *crisis profitability* in respect of statistics characteristics. With a high mean and full values (no zeros) of original variable *equity*, *crisis equity* has stronger explanatory power than other ratios coming from financing sources, except bank loans. The reason for having no zeros is that all firms have equity as an initial funding to start a business or a solid background to maintain and grow a business.Similarly, without zero values and marginal fluctuations (Standard deviation at 0.34) of its original variable profitability measured by ROS, *crisis profitability* is significant in explaining financial resilience. The full values are because *ROS* is available in any firm as a basic profit ratio to find return rate, possibly due to its simple calculation. By contrast, *credit crunch* is rejected because of its Standard deviation, at around 0.65, which is higher than its original variable bank lending, while most of the crisis variables have less fluctuations than original variables.

With regard to the impact of bank lending on British SMEs’ financial resilience, it is significantly negative. The more an SME relies on bank lending this year, the less financial resilience it has next year. It is easily to understand because in some mentioned reports, during crisis, bank lending is difficult to apply for and obtain, hence the less bank lending reliance established before crisis a small firm has, the more likely it is to survive. The study confirms the negative impact of bank lending on SMEs’ financial resilience with the findings of the studies of Byrne, Spaliara and Tsoukas (2016) regarding sensitivity to uncertainty and failure rates, and Chava and Purnanandam (2011) relative to valuation losses, capital expenditure and profitability. In addition, it confirms the results of Ryan, O’Toole and McCann (2014) as regards financial distress. The findings have two significant contributions adding to the previous studies. Firstly, it contributes new evidence of the negative effect on SME’s financial resilience of bank lending with British SMEs firms’ panel data from 2003 to 2012 with the Fixed Effects model. Byrne, Spaliara and Tsoukas (2016) conducted the study from unquoted UK panel data of both public and private enterprises in 2000 to 2009 with a log-log model. Chava and Purnanandam (2011) used American firms of all sizes during the Russian crisis of 1998 with the Fixed Effects model while the study of Ryan, O’Toole and McCann (2014) based on survey data of SMEs in Ireland from 2012 to 2014 with the Multinomial logit model. Secondly, in the crisis between 2008 and 2012, there is no causal relationship between credit crunch and financial resilience although generally, the amount of bank lending was affected negatively firms’ financial resilience. This study supports the study of Smallbone, Deakins, Battisti and Kitching (2012), which shows that three-quarters of British SMEs that were surveyed during the crisis of 2008 are unaffected by credit crunch. However, the finding is different from Byrne, Spaliara and Tsoukas (2016), who suggest that higher levels of uncertainty which partly come from the reliance on bank loans, coupled with limited access to credit, may lead to a high number of UK firm failures. The reason for the difference may partly come from different period end-dates: this study ended in 2012 while their study finished in 2009, and since 2010, the ratio of bank lending over assets dramatically decreased compared to that of 2009. Another reason is mentioned above, that missing values of the ratio of bank lending, especially in crisis, as well as the multiple effects of crisis time dummy variable, makes the distribution of *creditcrunch* spread more than the original variable *banklending*, which possibly leads to the insignificant p-value (Dahiru, 2008).

In respect of the impact of internal equity, it has a positive influence on financial resilience. If a small firm has more internal equity, it is more resilient financially in adapting to uncertainty. The mechanism behind this finding is, firstly, when a small firm experiences a tough economic cycle, and suffers from losses, equity can work like cash to finance investments or maintain a business. Secondly, a small firm with high internal equity ratio over assets, would be more likely to obtain extra debts, as the creditors would suppose the firm’s credit risk would be reduced if it has sufficient equity to back up debts. The study confirms the positive effect of internal equity on financial resilience from the studies of Smallbone, Deakins, Battisti and Kitching (2012) concerning vulnerability of UK and New Zealand SMEs by surveys in 2009, and Bernstein, Lerner and Mezzanotti (2017) regarding financial fragility of UK medium-sized private equity backed firms with the Fixed Effects model and panel data from 2004 to 2011. The study contributes by two evidences. Firstly, it offers new evidence of the positive impact of internal equity on financial resilience of SMEs in the context of the UK crisis of 2008, tested by the panel data from 2003 to 2012 as well as the regression Fixed Effects model. Secondly, its finding of the negative role of equity in crisis time on financial resilience in UK SMEs may be added to previous studies. During crisis, equity has a negative influence on SMEs’ financial resilience. In other words, during economic turmoil, if an SME has a high ratio of equity over total assets this year, next year it would have less ability to adapt. The mechanism can be explained partly by the inflexibility of financing. When crisis occurs, a small firm needs to adapt quickly and flexibly to maintain its business activities. During crisis there is a high need to spend an extraordinarily huge amount of money to maintain or change activities for adaption while internal equity is fixed and difficult to change in a short time. Hence the inflexibility of internal equity would partly deteriorate the financial resilience of SMEs, like a tradeoff between stability and flexibility of financing methods. The second contribution of equity differs from Smallbone, Deakins, Battisti and Kitching (2012), and Bernstein, Lerner and Mezzanotti (2017). While Smallbone and his team used the survey to conduct their study, namely a qualitative method, this study used a quantitative method. Also, the dependent variable of Bernstein and his team is outcome of investment and does not consider lagged explanatory variables, whereas this study focuses on the survival, vulnerability or failure, or financial resilience as dependent variables and uses lagged independent variables.

With reference to financial management skills, these cannot explain the financial resilience of British SMEs as hypothesis 3 is rejected. Possibly because of the data, hypothesis 3 has low p-value of t-test to be rejected. It confirms the result of the study of Casey and Bartczack (1985), and fails to explain how a small firm can survive during economic downturns. It is also possibly because of the measurements the study chose, namely the ratio of increased (decreased) cash over turnover and operating cash flow over liabilities. There could be some other more appropriate measurements for financial management skills.

Concerning the role of profitability in financial resilience of British SMEs, the effect is always positive. The higher ROS an SME has, the higher financial resilience it has, even in the condition of financial crisis. During crisis, the effect of profitability is positive on financial resilience of SMEs, but with smaller explanatory power, as its coefficient is less than the original variable’s coefficient possibly because of the multiple of crisis time (0 for the year before 2008). It supports the studies of Delmar, McKelvie and Wennberg (2013) and Bercovitz and Mitchell (2007) and contributes to the explanation of Smallbone, Deakins, Battisti and Kitching (2012) on resilient British SMEs in terms of profitability. The contribution here is the new evidence in the case of British SMEs with panel data during 2003 to 2012 with the Fixed Effects model. While Delmar used the panel data of Swedish new firms (startups) from 1995 to 2002 with the Fixed Effects model, Bercovitz collected the dataset of US firms of any size from 1978 to 1995 and ran accelerated time regression. Also, while most UK SMEs surviving firms reported that generating revenues and cutting costs were their solutions for the financial crisis of 2008, according to Smallbone, Deakins, Battisti and Kitching (2012), this study contributes by the panel data regression results, in quantitative aspect. The mechanism of the positive effect is as follows. SMEs have limitations of capital, and cannot easily obtain finance from external sources during the crisis, which potentially could lead them to firm exit. If SMEs have a business position with stable profitability before crisis, then during crisis, this profitability can help the firms generate capital in a condition of financial constraints. Along with internal equity, which is stable and difficult to raise in short-term, the ability to make profits, or self-generate sufficient capital, is a remarkable foundation for SMEs in fluctuating markets then to do investments or make adaptations. This is supported by the study of Gunasekaran, Rai, and Griffin (2011), which proves that capital generation is as a factor in SMEs’ resilience and the study of Smallbone, Deakins, Battisti and Kitching (2012), which states that surviving British firms generated revenues and cut costs to enhance their profitability during the crisis.

In supplier network term (measured by trade credit), generally the greater and stronger the supplier relationship, the more financially resilient a UK SME is. A SME with good relationships with suppliers can take advantage of the trade credit as a free short-term debt. If a firm cannot meet a payment during the term time, it would be fined with interest; otherwise, trade credit is free financing. Thus, it can use materials to make products and services and sell first, then return the money later. During the crisis, because bank lending is so expensive and difficult to obtain, trade credit is a good substitute for financial needs, and partly helps the business run smoothly. The positive impact on financial resilience is a confirmation of the studies of McGuinness, Hogan, and Powell, (2018) and Casey and O'Toole (2014). However, if only considering the effect of trade credit during and post crisis, it has no impact on SMEs’ financial resilience, because the crisis value of trade credit has p-value higher than any significance levels, which is a contribution of this study. It is different from the result of McGuinness, Hogan, and Powell, (2018) which shows that trade credit more evidently helps SMEs in the post crisis years. Although McGuinness’ study used the same methodology of Fixed Effects and time period, it has more diverse observations for the whole European SMEs, whereas this study only focuses on British SMEs, which possibly leads to a different result. Another reason comes from the data, as many UK SMEs do not report the value of trade credit, while the multiple of crisis time (0 for years before 2008) makes the effect of this crisis variable insufficient at any significance levels. In this case, the mechanism can be interpreted as follows: despite the substitute role of trade credit, during crisis when declining demands happened in any firms, there would be some difficulties if a firm allows its business partners to use trade credit as it itself also faces the liquidity shortage. Hence, possibly, the amount of trade credit during crisis would be reduced for reasons arising from the suppliers. The explanation is quite reasonable because the data shows that in most SMEs during and prior crisis period, this amount was actually less than that in the pre-crisis period. The second contribution is a new evidence of the methodology, compared to the study of McGuinness and Casey, which used European SMEs data; McGuinness used the method as mentioned above, while Casey used survey data with the Random Effects model.

In terms of financing diversity, it can help positively enhance the financial resilience of British SMEs. The diversity of financial options can bring flexibility to a small firm and reduce the dependence on bank lending, which is hard to access during the crisis. The study confirms the result of Clarke, Cull and Kisunko (2012), but with less confidence, because of the data. The measurement of financing diversity is a ratio between other financing methods over total assets. However, Fame does not show clearly the classification of each method, such as venture funding or hybrid instruments, hence the study just focuses on leasing and purchasing or group loans, which is mentioned in the study of Cosh and Hughes (1994). Thus, from the data Fame offers, it is impossible to see the innovative financing methods British SMEs have, which is a limitation of this study. Also, the study chose unlisted firms, which limits the access of venture fundings or securitization methods of British SMEs. The contribution is not only a new evidence of the methodology, which is different from Clarke, Cull and Kisunko (2012) that focuses on Eastern Europe and Central Asia in 2002, 2005 and 2008 and 2009 (but unclear about the model used) but also the crisis effect of diversity of financing. During crisis, there is no effect on SMEs’ financial resilience. The possible reasons are from data with missing values and multiple of crisis time, and from the fact that the amount of leasing, purchasing and group loans reduced because of credit crunch, and because of increased credit risk when the borrower or SMEs have less ability to insure the loans they borrow. The effect of credit crunch makes lending firms more strict in giving loans, which can be proved by the fact that over 70% of SMEs cannot seek external sources if they are rejected by banks (Department for Business, Innovation & Skills and HM Treasury, 2013), while the credit risk is shown by the reduced amount of internal equity as well as profitability, from the data collected.

Concerning the dummy variable crisis time and control variables, they have an impact on SMEs’ financial resilience with different direction and different levels. Crisis time surprisingly makes an SME become more resilient, along with the marginally positive effect of growth. However, the bigger a firm is, the less financial resilience it has. The effect of crisis time, dummy variable, is in contrast with the finding of McGuinness, Hogan, and Powell, (2018). This study used value 1 for both during- and post-crisis periods, but McGuinness’ study separated during- and post- crisis periods. Although the different approaches of this dummy variable in this study and McGuinness’ study potentially lead to different results, the study cannot explain the mechanism behind the effect of crisis time on financial resilience of SMEs. In terms of firm size, in this study it has a negative effect, an opposite result compared to the positive effect on firm’s survival of Clementi and Hopenhayn (2006), Byrne, Spaliara, and Tsoukas (2016). Regarding growth, it is confirmed by the study of McGuinness, Hogan, and Powell, (2018) which also used sales growth as a control variable.

## 4.6 Implications

Based on the regression result, there are some implications for policy makers and SME owners. Regarding policy makers, they should provide some stable financing strategies to support SMEs. The result shows that, during crisis, bank loans or other financing sources have no effect on firms’ financial resilience, possibly because they vary significantly, and are limited and difficult to obtain due to the financial crisis, while for the whole 10-year period, diversity of financing and bank lending have a strong effect on SMEs’ financial resilience. SME owners, in order to enhance their financial resilience, need to build their business position and capacity by first enhancing their ability to make profits and also supplier network and diversifying their financing sources. The result shows that profitability, internal equity, supplier network, and diverse financing have significant influence on SMEs’ financial resilience; especially during crisis the effect of profitability and internal equity do help SMEs mitigate the adverse impact of financial crisis. Hence, if an SME has a strong ability to make profits in any situations, in the long run, the internal equity would be built up due to retained earnings, which helps it raise its internal strength. During crisis, this profitability can help SMEs generate capital for more investments, and become more resilient to unexpected events. Besides that, maintaining a wide and good supplier network or diverse financing sources would help SMEs to have less dependence on bank lending and become more flexible in financing.

## 4.7 Limitations and Future Research

The first limitation is the measurement of dependent variable financial resilience. Actually, different firms have different financial resilience levels, and cannot be only classified as 0 (no financial resilience) and 1 (have financial resilience). For further study, it could be taken as a set of variables that can lead to a range of values of financial resilience. Secondly, choosing only unlisted SMEs restricts the values of hypothesis 6. Hence, future research could omit this constraint and also find more information about innovative financings that Fame cannot offer, to measure the diversity of financing factors. Thirdly, some variables have high correlation, namely variables about financing methods, because they are divided by total assets and they are a tradeoff with each other. This could possibly reduce the reliability of the study. Finally, Fixed Effects model control some unobservable variables which may affect significantly on small firms’ financial resilience as the observed variables only explain 19% of financial resilience. In future studies, this issue of reliability should be solved by adding more variables in more aspects, such as sustainability. Besides these suggestions above, future studies would be more reliable if more observations are taken into account with longer time periods, with more financial crisis incidents and across more countries. Also, a Robustness test should be considered to double-check test the effect of those factors on financial resilience in categories such as size: micro, small, medium firms.

In summary, the chapter demonstrates the steps from the original data to regression results, then compares and contrasts with prior research about the role of expected factors on financial resilience. The findings show new evidences in data and regression model for some previous studies’ results and defines financial resilience. Differing from the expectations, the role of internal equity during- and post-crisis period actually plays a negative influence whereas some factors, such as bank loans and trade credit, have results different from previous studies. Finally, the study gives some suggestions to policy makers and SME owners as well as to future studies based on the study’s limitations.

# 5 Conclusion

The study used the panel data of approximately 10,000 SMEs in the UK to find factors contributing to the firms’ financial resilience during crisis. Studies of the financial resilience of a small firm are not well-developed yet but the questions about financial features of survivor SMEs during tough economic conditions need to be clarified. Hence, this study confirms and contributes to the existing literature and gives empirical evidence of some possible factors in SMEs’ financial resilience. While financial resilience is considered as survival or failure probability or vulnerability, three expected factors collected from prior studies but still contrasting are bank lending dependence, flexibility in financing, supplier network and financial management, and internal strength from profitability and equity.

Using data collected from 2003 to 2012 to observe their effects on SMEs’ financial resilience in the crisis of 2008, the Fixed Effects model was used to run regression with Stata software. The results were then interpreted, compared and contrasted with other studies, and implications considered, as well as giving suggestions for further studies with the main points summarised below:

* Financial resilience of a British SME is affected positively by supplier network (trade credit), profitability, equity strength and diversity of financing, but negatively by bank loans dependence.
* During crisis, the key factor in maintaining or enhancing an SME’s financial resilience in the UK is profitability. Internal equity negatively influences the financial resilience.
* Other expected factors, such as the adverse effect of credit crunch, supplier network, and diversity of financing have no causation relationship with financial resilience of British SMEs during the crisis but do have an effect over the whole 10-year period. Financial management skills measured by operating cash flow and cash have no impact on financial resilience.
* Policy makers should consider maintaining a stable financing strategy for SMEs, with easier access to finance. SME owners should focus most on profitability, then supplier network and diversity of financing.
* A future study could be conducted once the limitations of this study can be solved. The limitations are namely measurement of financial resilience, constraints on selection of SMEs, highly-correlated explanatory variables, the limitations of Fixed Effect model as well as the small scope of the study with 23% of total searched British firms from Fame database. Besides that, further studies could take into account more financial crisis incidents, data from more countries and addition of more aspects, such as sustainability to enhance the reliability.

Personally, the study faces challenges in finding factors affecting financial resilience from previous studies because the knowledge of ‘financial resilience’ is not well-developed yet, then finds measurements for the variables, and struggles when using Excel to manage the large database. After three months, I have learned how to do a research with first doing literature review from previous research, get the skills to manage big data with Coding (Excel VBA) and Stata quickly. Besides that, I improve the skills of choosing the appropriate model, interpreting the results and comparing and contrasting with the existing studies to make theoretical contributions as well as giving suggestions for industry and further studies.

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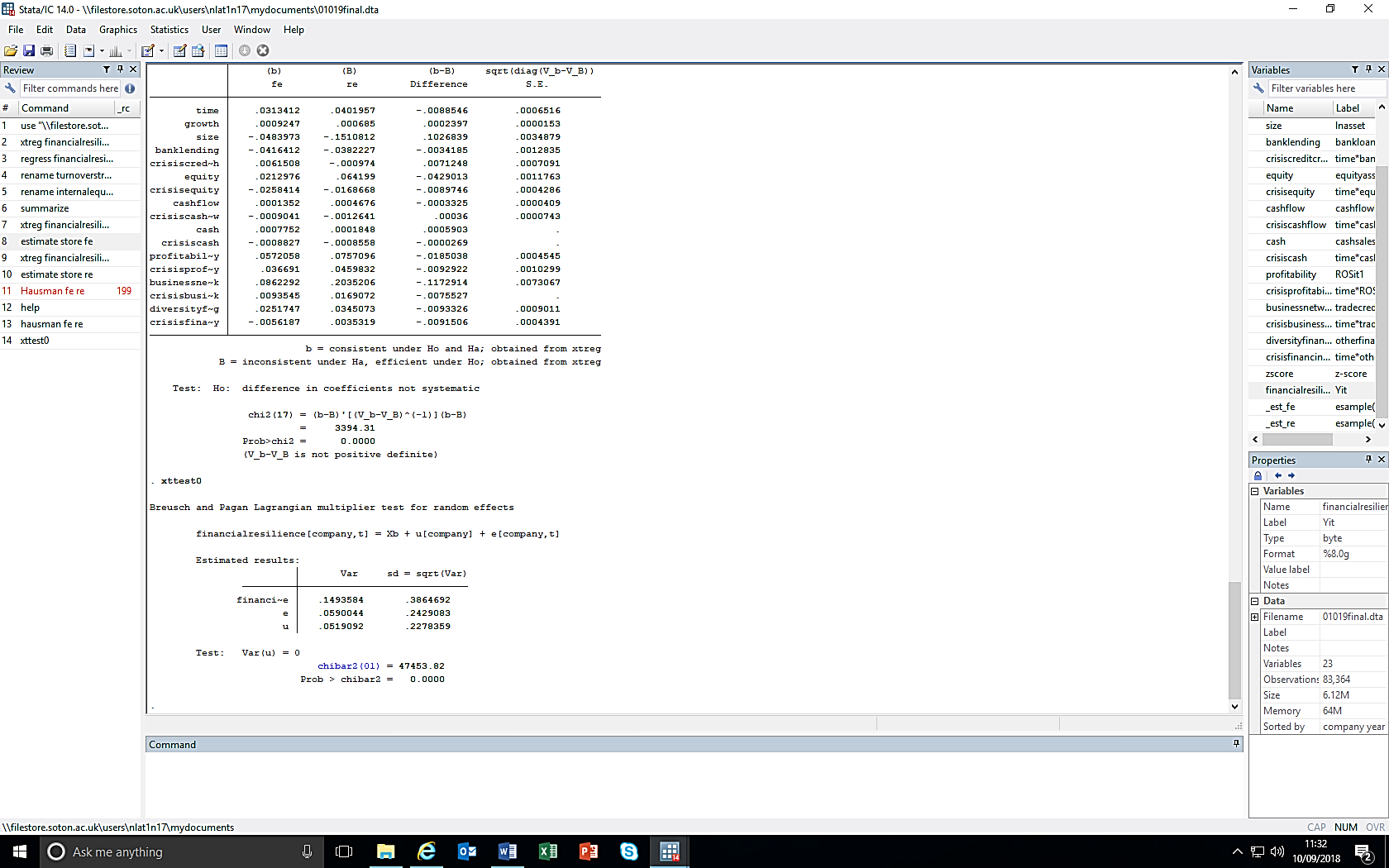
# Appendix I. Industry classification of SMEs

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Industry sector** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **Total** | **%** |
| Primary Sector (agriculture, mining, etc.) | 133 | 136 | 142 | 148 | 147 | 150 | 148 | 148 | 145 | 144 | 1,441 | 2% |
| Food, beverages, tobacco | 175 | 181 | 187 | 194 | 197 | 201 | 203 | 205 | 203 | 200 | 1,946 | 2% |
| Textiles, wearing apparel, leather | 63 | 69 | 70 | 72 | 75 | 75 | 74 | 74 | 74 | 73 | 719 | 1% |
| Wood, cork, paper | 111 | 112 | 113 | 119 | 119 | 121 | 114 | 115 | 114 | 114 | 1,152 | 1% |
| Publishing, printing | 164 | 173 | 175 | 182 | 186 | 188 | 181 | 184 | 185 | 178 | 1,796 | 2% |
| Chemicals, rubber, plastics, non-metallic products | 411 | 427 | 431 | 439 | 449 | 458 | 452 | 449 | 446 | 442 | 4,404 | 5% |
| Metals & metal products | 253 | 259 | 268 | 277 | 289 | 293 | 288 | 287 | 283 | 275 | 2,772 | 3% |
| Machinery, equipment, furniture, recycling | 971 | 1,001 | 1,022 | 1,043 | 1,066 | 1,080 | 1,063 | 1,052 | 1,034 | 1,015 | 10,347 | 11% |
| Gas, Water, Electricity | 31 | 34 | 35 | 41 | 43 | 45 | 44 | 45 | 45 | 45 | 408 | 0% |
| Construction | 804 | 832 | 855 | 886 | 913 | 945 | 893 | 844 | 827 | 798 | 8,597 | 9% |
| Wholesale & retail trade | 1,713 | 1,750 | 1,806 | 1,831 | 1,873 | 1,934 | 1,876 | 1,856 | 1,822 | 1,782 | 18,243 | 20% |
| Hotels & restaurants | 157 | 172 | 185 | 187 | 202 | 208 | 204 | 201 | 201 | 200 | 1,917 | 2% |
| Transport | 356 | 362 | 373 | 384 | 384 | 394 | 390 | 389 | 379 | 371 | 3,782 | 4% |
| Post and telecommunications | 119 | 130 | 138 | 147 | 148 | 151 | 153 | 146 | 143 | 143 | 1,418 | 2% |
| Other services | 2,645 | 2,821 | 3,016 | 3,187 | 3,371 | 3,520 | 3,394 | 3,323 | 3,267 | 3,219 | 31,763 | 34% |
| Education, Health | 106 | 116 | 128 | 137 | 148 | 157 | 155 | 154 | 153 | 149 | 1,403 | 2% |
| **Total** | **8,212** | **8,575** | **8,944** | **9,274** | **9,610** | **9,920** | **9,632** | **9,472** | **9,321** | **9,148** | **92,108** | **100%** |

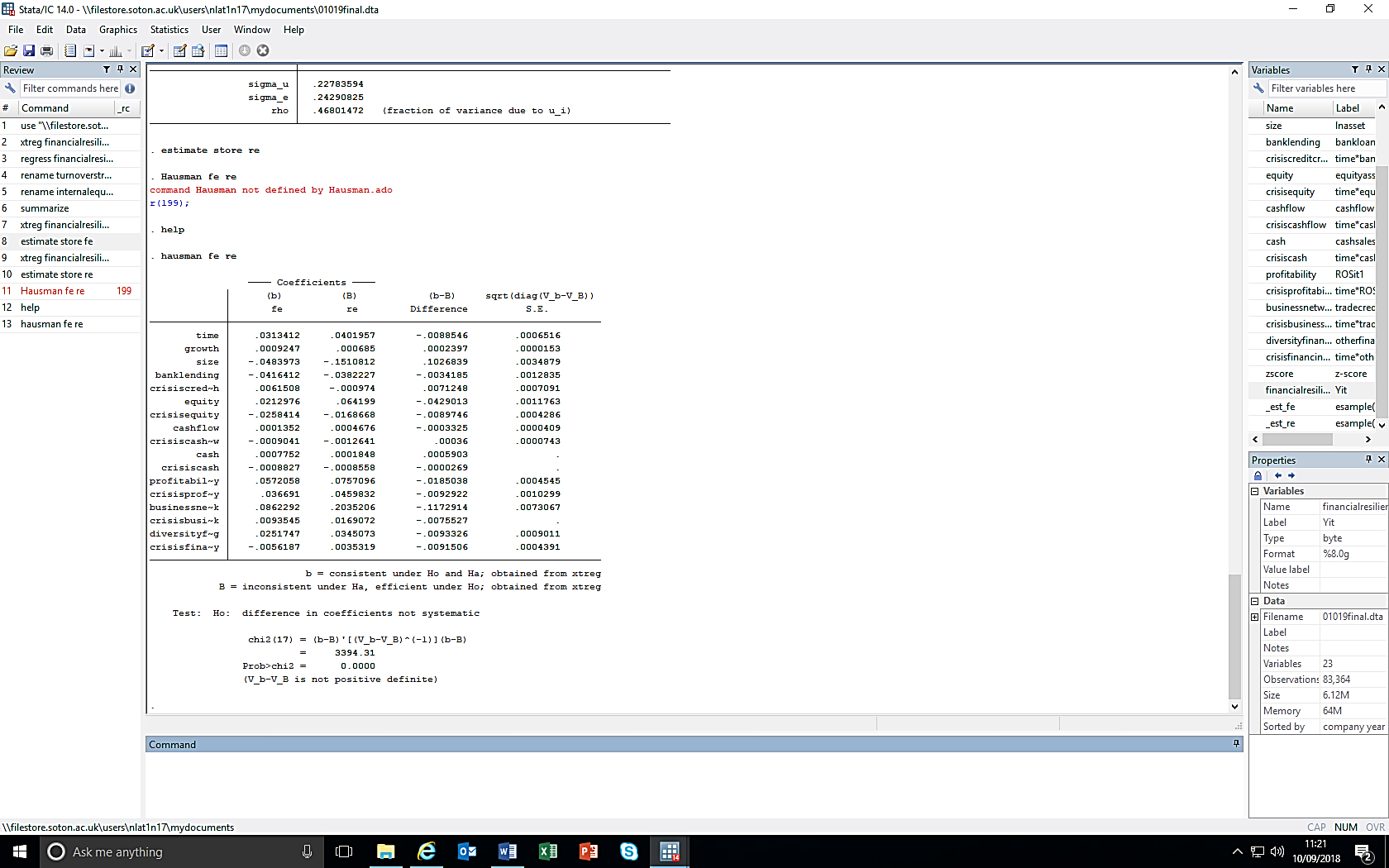
# Appendix II. Variable statistics description

# Appendix III. Test results

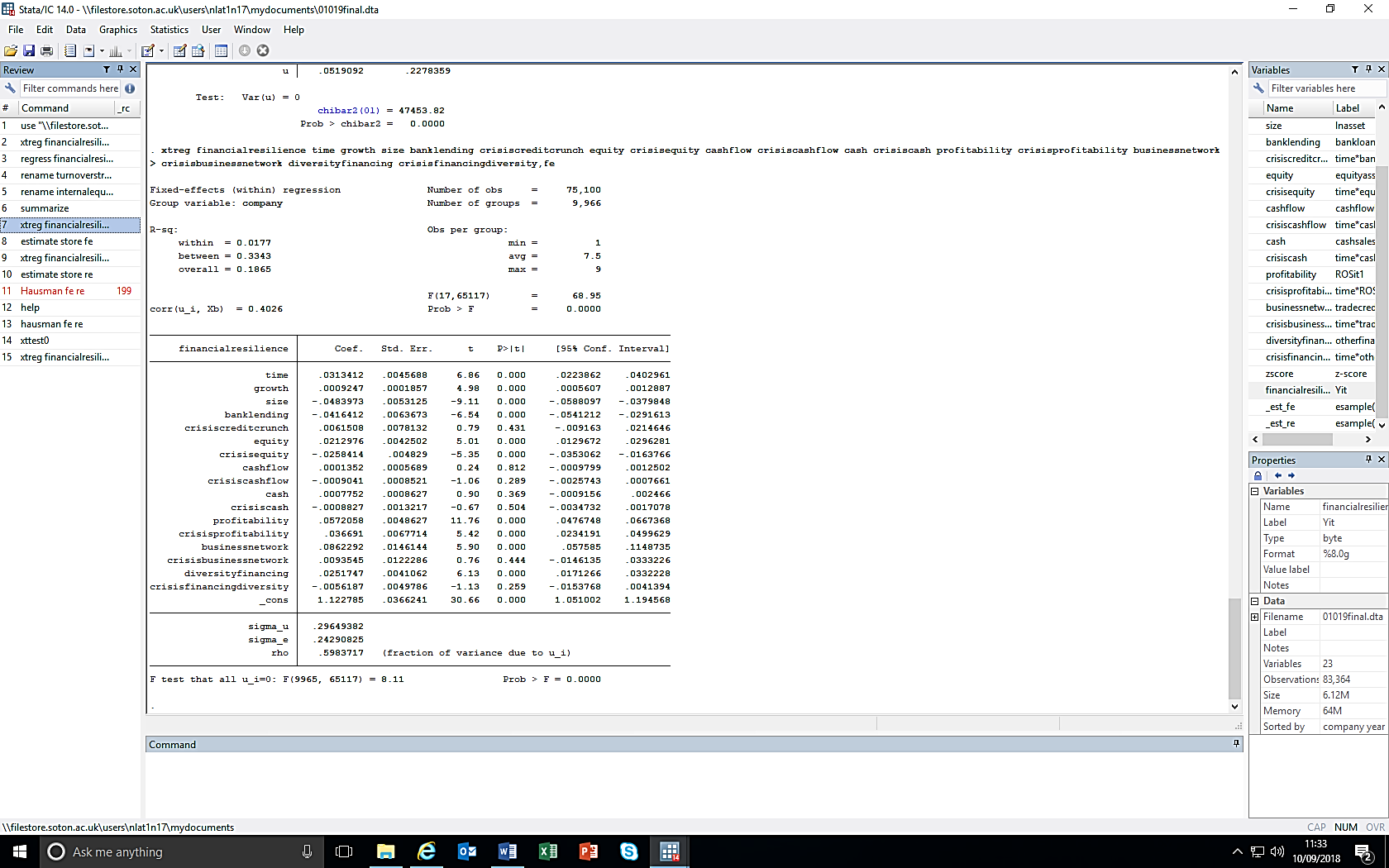
**Breusch and Pagan Lagrangian multiplier test**



**Hausman test**



**Fixed Effects regression result**



# Appendix IV. Correlation matrix