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TOP EXECUTIVE GENDER AND CREDIT RISK

An analysis for North American firms

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Abstract

Top executive gender and credit risk: An analysis for North American firms

This study examines the relationship between the CEO and CFO gender in large, public North American firms and credit risk, through the analysis of filings and delisting for bankruptcy, from 2007 to 2016. Using panel logit regressions for two models with similar specifications to those used by Campbell et al. (2008), I find with some statistical significance that, everything else constant, firms with females in these top positions are only less than 0.02 percentage points more likely to file or be delisted for bankruptcy, thus concluding that gender has relatively no effect on firm creditworthiness.

Keywords: Bankruptcy, Credit Risk, Gender, Logit Model, Top Executives

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1. Introduction

Despite the large and increasing number of women that graduate in areas such as Business, Finance and Economics, there is still a widespread belief that men are better suited for executive positions in these fields. Perhaps, as a consequence, although the number has increased, the total of female CEOs (Chief Executive Officers) and CFOs (Chief Financial Officers) of large companies is still far from the number of men in these positions (Fortune, 2017).

Previously, on the topic of gender diversity and discrimination, several studies have researched the relationship of board members or top executive gender and firm performance (Erhardt et al., 2003 and Robb and Watson, 2012). However, the relationship between board members or top executive gender and credit risk was far less explored, and the research available is mainly directed at small firms (Agier and Szafarz, 2010). I believe this latter relationship is worth further study since, although they are distinct financial matters, financial performance and credit risk are inherently connected. Furthermore, there are many opposing study results and real-life beliefs on who is the riskier gender, and these views affect female representation in top executive positions and corporate boards, consequently leading to possible bias from banks and other credit institutions.

Thus, with this study I aim to explore this relationship between gender and creditworthiness for larger, listed companies, being the main research question for my thesis "Does the presence of female Chief Executive Officers (CEOs) or Chief Financial Officers (CFOs) impact firm creditworthiness, by increasing the likelihood of the firm filing or being delisted for bankruptcy?" I do this by closely following the models proposed by Campbell, Hilscher and Szilagyi (2008) in the first part of their paper, adding a dummy for gender, which equals one whenever a company, in a specific quarter, has either a female CEO or CFO and zero if these positions are only filled by men. Furthermore, I include year dummies, country and industry as

control variables. As in Campbell et al. (2008), this study analyses North American firms, and aims to estimate the probability of filing or being delisted for bankruptcy through variables constructed from accounting and market information. By doing this study for the years between 2007 and 2016, I also investigate if their findings regarding the impact of certain accounting and market variables in corporate failure is also relevant for more recent years. In order to study this, I use two pooled OLS logit models using panel data.

On the relationship between gender and risk, as I mention previously, different studies find opposing results on who is the riskier gender. As such, my *a-priori* expectation would be that the presence of female top executives has no impact on the creditworthiness of a company, challenging the view that women are less suited for these top position roles as a consequence of their riskiness or a lack thereof.

In regard to the extension I perform of part of the study by Campbell et al. (2008) for more recent years, I expect to find a higher number of bankruptcy filings or delisting by bankruptcy in my dataset for 2008 and 2009, since these years followed immediately after the great financial crisis of 2007, when it is known that many, even large, companies defaulted and went bankrupt. I further predict that the market measures of profitability and leverage will increase the predictive power of the regressions (in comparison to the same book measures). And, overall, I expect to have more extreme results in terms of minimums and maximums, lower means for net income and price per share, and a higher mean for leverage.

By investigating if indeed there is a relationship between gender of top executives and creditworthiness of large public firms, this study fills in a gap in the available literature regarding gender diversity and discrimination in business, which tends to be directed at small firms or focus on financial performance. Moreover, by using accounting and market variables as remaining predictor variables for financial distress, the gap between the two on the context

of gender diversity in business is bridged. The main results of this study suggest that, everything else constant, top executive gender has close to zero effect on the likelihood of a firm filing or being delisted for bankruptcy, with strong statistical significance.

The remainder of this thesis is organised as follows: Section 2 reviews the literature on gender differences and discrimination, and how these interact with risk aversion, bank loan conditions and financial performance, as well as the available literature on financial distress. Section 3 displays the methodology used and Section 4 analysis the key features of the data used in this study. Section 5 covers the results of the research, which are further discussed in Section 6. Finally, in Section 7 this study concludes with a summary of the main results and an analysis of the limitations of the research, as well as suggestions of possible future research on this topic.

2. Literature Review

2.1. Business and finance gender studies

As of January 2017, only 6.4% of the CEO and 12.5% of the CFO positions at the Fortune 500 firms were held by women (Fortune, 2017 and Kambil and Larson, 2017). These low figures are already the result of a steady increase over time in the number of women represented in the top positions of large companies. Nevertheless, women are still clearly underrepresented, and Thomas et al. (2017) corroborate this, stating that, as of 2017, women are still underrepresented at every corporate role, but this gender gap is the largest in the C-Suite, in which women occupy only 21% of the positions. This lack of female representation in top executive roles raises two important questions. Firstly, why are women so underrepresented? And, secondly, does gender of top executives directly impact firm performance and creditworthiness?

The literature discusses several intertwined explanations to the lack of women in top executive positions. A common explanation is gender bias, which might lead to unequal treatment in

terms of employment opportunities and career advancements based on the gender of the employee. Several studies suggest that gender bias is present in various ways in the procedures of executive search firms in their search for top executives (such as Tienari et al., 2013). However, gender discrimination when hiring for top positions can also be found in internal hiring. Thomas et al. (2017) investigate the representation of women in the workplace and state that women hit the *glass ceiling* very early on in their careers, being 18% less likely than men to be promoted to managers from an entre-level role, and if this initial disparity disappeared, the number of women in the highest corporate roles (such as, in CEO, CFO and Senior Vice President positions) would be, at least, twice as much.

Gender differences can be often found to be the foundation of this gender bias. Gender differences are the product of social influences and experiences, that begin during childhood and continue throughout a person's lifetime (Bandura, 1977). On themselves, gender differences are not discriminatory, but they lead to gender conceptions (Bussey and Bandura, 1999) which influence how men and women are seen by each one of us and the population in general, and this can lead to gender bias. Fortunately, in the past decades there has been an increase in the literature available which analyses this gender differences in terms of the accounting, financing and investments decisions of top executives (e.g. Charness and Gneezy, 2012, Francis et al., 2013 and Vähämaa, 2014).

Risk-aversion, which relates to the attitude of an individual towards risk, is a trait commonly studied in terms of gender differences. The general view of the population is that women are more risk-averse than men. And, indeed, many financial studies support this. Charness and Gneezy (2012) find that, financially, women have a tendency to be more averse to risk, observing in their experiment that they invest less than men in risky assets. Eckel and Grossman (2002) also conduct an experiment in which the subjects must choose among five alternative

gambles, which differ in terms of expected return and variance, and they find that females are consistently more risk-averse. Other examples of studies that corroborate that women are (financially) more risk-averse are Borghans et al. (2009), Francis et al. (2015) and Jianakoplos and Bernasek (1998). However, there is evidence that female and male directors indeed differ in their attitudes but, as a consequence of thorough selection processes to advance towards higher levels in an organization, gender differences ascertained in the general population might not be found in top management. Hence, some more recent studies find that, indeed, once women are in a position of power, they are more risk-seeking than men. Adams and Funk (2012) and Berger et al. (2014) find that women in board positions are more risk loving than men and increase portfolio risk. Moreover, evidence suggests that the gender conceptions that loan officers have regarding risk-aversion often lead to gender bias in the conditions given to firms seeking credit (Grunert et al., 2005 and Francis et al., 2013). Agier and Szafarz (2011) investigate gender discrimination in loans to small-businesses, and find that women receive smaller loans and that this gender gap increases with relationship. This latter study raises another interesting conclusion: they find that, although men and women have a similar probability of default, women exhibit a lower probability of delay in their payments and, more important, lead to smaller losses, proving to be more creditworthy.

Finally, several studies have examined the impact of top executive gender on financial performance. Among others, Francis et al. (2005) ascertains that hiring of female CFOs leads to the adoption of more conservative accounting policies and strategies. But contradictory evidence can be found in the study of other financial decisions. Whereas Huang and Kisgen (2013) conclude that the likelihood of female CFOs making substantial acquisitions is lower than male CFOs, Ahern and Dittmar (2012) find that the introduction of mandatory quotas for gender of board members lead to increases in acquisitions and to a worsening of the performance of Norwegian publicly quoted firms. Faccio et al. (2016) conclude that firms with

female CFOs exhibit lower leverage, less volatile earnings and higher odds of survival than comparable firms with male CFOs. Adams and Ferreira (2009) find that firms with boards with more gender diverse members tend to show a greater worry and allocate more resources to monitoring, nonetheless these boards tend to perform worse than those which are dominated by male members.

Overall, the literature indicates several reasons to the lack of women in top executive positions comparatively to men, such as: the selection processes, internally and externally; gender differences regarding risk-aversion and consequent creditworthiness; and, perhaps the most enunciated, the display of worse performances by female CFOs. But, empirical research cannot consistently find proof of poorer quality of financial decisions adopted by females, and there is evidence of gender bias both in the selection processes to higher hierarchical roles and in the perceptions of risk-aversion depending on gender. However, apart from the study by Agier and Szafarz (2011) directed at small businesses and focused on entrepreneur gender, little has been studied on the direct impact of top executive gender on probability of default and firm creditworthiness. Thus, by studying this matter, I aim to make an academic contribution to the gender diversity and discrimination in business and finance literature and hopefully shed some light on whether this impact (or lack thereof) is another possible explanation for the lack of female representation in higher executive levels.

2.2. Financial distress studies

Credit risk refers to the possibility that a borrower may default on a payment, usually referring to loans or bonds. Naturally, a high risk of payment failure is associated with a high risk of default or financial distress. Some papers have studied default risk by analysing default on loan contracts (Agier and Szafarz, 2011 and Castillo et al., 2017), but most of the literature investigates it by trying to estimate probability of bankruptcy, based on financial ratios.

Altman (1968) wrote, possibly, some of the most known and cited papers on the topic of bankruptcy probability, with Altman's Z-score becoming some of the more commonly accepted measures to predict financial distress. Altman (1968) estimate bankruptcy likelihood using a static model. However, more recent papers use dynamic logit models to predict the likelihood of bankruptcy. Shumway (2001) and Chava and Jarrow (2004) are examples of these studies, and they justify their use of dynamic models stating that static models lead to biases that overestimate the impact of the explanatory variables, since there is a strong possibility that periods before there is a bankruptcy, there already warning signs in the accounting and market data of distressed firms.

Campbell, Hilscher and Szilagyi follow the work done by Shumway (2001) and Chava and Jarrow (2004) and publish a paper (Campbell et al., 2008) in which it is also applied a dynamic model with logit specifications to predict financial distress. The study uses two indicators for financial distress, one for bankruptcy and a broader one for failure, and find significant evidence that certain accounting and market variables have a strong impact on probability of bankruptcy or failure, and by lagging certain variables they show that there are indeed prior signs in this data indicating that a firm might be in a clear path to financial distress periods before a bankruptcy occurs.

Considering that this paper is one of the most recent and cited works on financial distress, I follow in this study the work done by Campbell et al. (2008) and use accounting and market information (as well as firm characteristics as control variables) to predict probability of bankruptcy.

3. Methodology

In order to study the relationship between top executive gender and credit risk, I follow the models suggested by Campbell et al. (2008), which in turn follow Shumway (2001) and Chava

and Jarrow (2004), using a panel model with logit specification to estimate the probability of filing or being delisted for bankruptcy over the next period.

It is, thus, assumed that the marginal probability of bankruptcy over the following period follows a logistic distribution which is given by

$$\boldsymbol{P_{t-1}(Y_{it} = 1) = \frac{1}{1 + \exp(-\alpha - \beta x_{i,t-1})}}, \quad (1)$$

where Y_{it} equals one if the firm files or is delisted for bankruptcy in quarter t, and $x_{i,t-1}$ is a vector of independent variables known at the end of the previous quarter, with a higher level of $\alpha + \beta x_{i,t-1}$ implying a higher probability of bankruptcy.

As mentioned, I follow the models presented by Campbell et al. (2008) and create two different sets of specifications for the panel multivariate logit regressions similar to the models presented in their paper. Model 1 uses six standard variables: GNDR, NITA, TLTA, EXRET, SIGMA, and RSIZE. In this model, assets are measured using book values. In Model 2, NITA and TLTA are substituted by NIMTA and TLMTA, in which assets are measured using market values. In Model 2, the variables CASHMTA, MB and PRICE are also included. Country, industry and year dummies are also included as control variables in both models.

In Section 5, I only report results for the regressions with pooled OLS logit specifications with clustering of standard errors, in detriment of fixed-effects or random-effects specifications. Running the Likelihood-Ratio test and the Hausman test, for which the null hypotheses are that the unit-specific variance is zero and that the preferred model is random-effects, respectively, both null hypotheses are rejected, which indicates that panel specifications should be used and that fixed-effects are preferable to random-effects. However, the results of the fixed-effects logit regression, as well as the results of a secondary study using the Chi-Square test of

independence that can be read in Appendix B, lead me to conclude that the results of the fixed-effects regression were subject to high variance and would not allow to draw clear and correct conclusions, due to the possible presence of reverse causation between gender and the time-invariant variable industry (Allison, 2009). As such, I only include results for the pooled OLS logit regressions with clustering of standard errors. The clustering of standard errors corrects for standard errors underestimation, and clustering id allows for intragroup correlation (that is, for correlation within each firm), maintaining the observations independent across groups

4. Data

To study the relationship between top executive gender and credit risk, an indicator of firm default or failure in meeting the firm's obligations is needed, thus I use filings for bankruptcy and delisting by bankruptcy as the bankruptcy indicator. This bankruptcy indicator is equal to one in a quarter in which a company filed for bankruptcy or was delisted for bankruptcy and zero otherwise. If, after the period in which bankruptcy was filed in, the firm in fact bankrupts and disappears from the dataset, the bankruptcy information will show as missing information; this will also happen if a firm disappears from the dataset for a reason other than bankruptcy. The information on bankruptcy filings was retrieved from COMPUSTAT (inactivation code 02) and the information on delisting for bankruptcy from CRSP (delisting code 574) (Carvalho et al., 2014), hence making this a study for companies from North America.

Figure 1 shows the percentage of active firms that went bankrupt in each year. In this study, a firm is considered active in a certain year if it existed for at least one quarter in that year and there is full accounting and market data for each active quarter.

As expected, it is observed an increase in the number of bankruptcy filings and delisting for bankruptcy in the years following the 2007 crisis, reaching its peak for the last ten years in 2009. However, it can also be seen a second relevant increase in this number in 2014, that peaks in 2015. Reuters justifies this second climb with the plummeting prices of crude oil and other commodities as well as with it being a consequence of "a more aggressive stance by lenders" (Reuters, 2015).

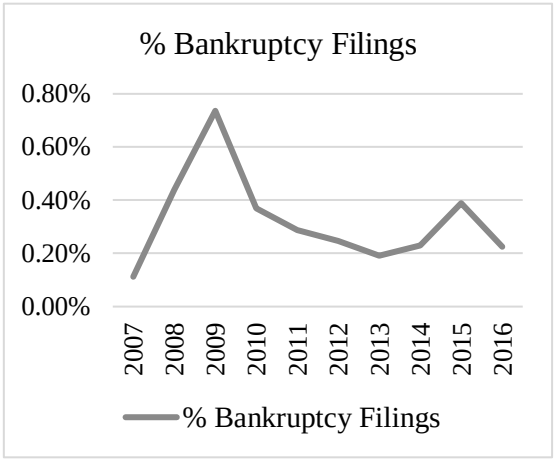

Figure 1 – Percentage of active firms that filed or were delisted for bankruptcy per year

To construct the explanatory variables at the individual firm level, quarterly accounting and equity market data from COMPUSTAT is used, data on the S&P500 index is retrieved from DATASTREAM and data on CEO and CFO gender is obtained through ORBIS. In the organization of the data, it is always used fiscal year.

Following Campbell et al. (2008), the following accounting measures are constructed: Net Income to Total Assets (adjusted) (NITA), defined as the book measure of profitability; Net Income to Market-valued Total Assets (NIMTA), defined as the market measure of profitability; Total Liabilities to Total Assets (adjusted) (TLTA), defined as the standard/book measure of leverage; Total Liabilities to Market-valued Total Assets (TLMTA), defined as the market measure of leverage; Cash and Short-Term Investments to Market-valued Total Assets (CASHMTA), defined as the measure of liquidity; and market-to-book ratio (MB).

Although no corrections are made to book value of equity, outliers in book value of assets are also dealt with as it is originally suggested by Cohen, Polk, and Vuolteenaho (2003), by adding to the book value of total assets 10% of the difference between market and book equity,

increasing extremely low book values that were probably not well measured, and which create outliers when then used in the calculation of financial ratios. Furthermore, to limit the impact of outliers, all the variables in the model are winsorized at the 5th and 95th percentiles of their pooled distribution, for all firm-quarters.

The following market based variables are also calculated: quarterly log excess return on equity of each firm relative to the S&P500 index (EXRET); relative size of each firm relative to the S&P500 index (RSIZE); log price per share of each firm, truncated above at 15$ (PRICE), and standard deviation of each firm (SIGMA).

As control variables, it is used size (RSIZE), industry (IND), country (CNTR) and year dummies for the years between 2007 and 2015.

Finally, to state the presence of female CEOs or CFOs, a gender indicator is created (GNDR) which equals one when there is at least one female CEO or CFO and zero if there are only men in these positions. From the moment a company disappears from the dataset, this indicator presents a missing value. An extra gender indicator is added (FEMALE) which equals one for firms that had female top executives at some point in time and zero for firms that at all times only had male CEOs or CFOs.

Figure 2 displays the percentage of active firms in the dataset with female CEOs or CFOs in each year. This figure confirms the ever-growing trend in the number of firms with female CEOs or CFOs which was expected from the reports by Deloitte, Fortune, the European Commission and McKinsey. However, Figure 2 also corroborates the large gap that still exists between firms with

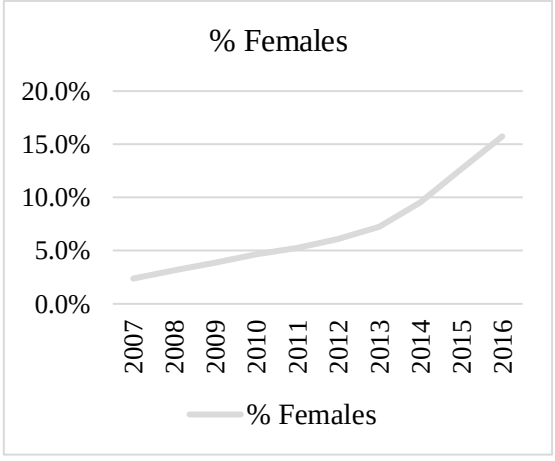

Figure 2 – Percentage of active firms with, at least, a female CEO or CFO per year

only male top executives and firms with at least one female top executive, with firms with only male CEOs and CFOs still representing the vast majority in 2016 in this dataset (84.3%).

4.1. Summary Statistics

Table 3 summarizes the properties of the 11 explanatory variables. Panel A describes the properties of the variables for the full sample, for 520,240 firm-quarters. Panel B describes the properties of the variables for the bankruptcy filing sample, for 9,480 firm-quarters. Similar to what succeeds in the paper by Campbell et al. (2008), also in this study all firm-quarters are weighted equally.

Table 1 – Summary Statistics

This table includes summary statistics for all the explanatory variables included in my models for the panel data groups. Panel A displays summary statistics for all firm-quarter observations and Panel B displays summary statistics for the bankruptcy filing and delisting group, denoted simply as bankruptcy group.

	Panel A. Full Dataset			Panel B: Bankruptcy Group				
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Min.	Max.
GNDR	0.065	0.000	0.246	0.063	0.000	0.243	0.000	1.000
NITA	-0.061	0.002	0.172	-0.097	-0.033	0.171	-0.609	0.095
NIMTA	-0.025	0.002	0.078	-0.055	-0.024	0.087	-0.260	0.059
TLTA	0.519	0.487	0.335	0.712	0.723	0.328	0.018	0.925
TLMTA	0.399	0.345	0.293	0.587	0.639	0.297	0.018	0.925
EXRET	-0.005	0.007	0.135	-0.052	-0.044	0.167	-0.301	0.254
RSIZE	-4.900	-4.893	1.023	-4.953	-4.976	0.849	-6.750	-3.099
SIGMA	0.558	0.391	0.500	0.774	0.601	0.549	0.098	2.090
CASHMTA	0.103	0.056	0.120	0.089	0.054	0.101	0.001	0.444
MB	2.123	1.406	3.012	1.699	1.004	2.970	-3.469	10.816
PRICE	1.123	2.018	2.007	1.012	1.314	1.591	-9.210	2.708

Regarding gender, I observe in both panels, as expected, that most firm-quarters have only male top executives. In terms of profitability, the book measure of net income (NITA) has a lower mean than the respective market measure (NIMTA) in two groups, which is expected from the results in Campbell et al. (2008). Furthermore, I find the minimum values for both NITA and NIMTA in this study are much lower than the ones presented in their paper, which might come has a consequence of the 2007 financial crisis. Regarding leverage, in the full sample I find

smaller mean and median values for the market measure (TLMTA) than for the book measure (TLTA), which is expected from the summary statistics presented by Campbell et al. (2008), however the gaps I find are almost twice those found in their study. Moreover, in the analysis of the full sample, for TLTA, I find a much larger gap between minimum and maximum than the one found by Campbell et al. (2008). For TLMTA, the maximum is similar to that found by them (92.5% in this study and 92.3% in their paper). I also find, similarly, smaller mean values for TLMTA in the bankruptcy group. Concerning excess returns, Campbell et al. (2008) display a monthly average of -1.1%, while I find a quarterly average of -0.5%. These negative returns are a clear proof of the underperformance of stocks in the wake of the financial crisis. I also obtain very different values to those reported by Campbell et al. (2008) in terms of firm size, with their maximum value being similar to the minimum in this study for the full sample, which demonstrates the dataset in this study is composed by significantly larger companies. I also find the mean and median for RSIZE in this study are similar in both panel A and B. For the full sample, the average cash and short-term investments and market-to-book values are higher than those presented by Campbell et al. (2008), and for cash and short-term investments the gap in the mean between full sample and bankruptcy filing group is not as large as the one they reported; for market-to-book I also find that in the bankruptcy group the mean is lower (while they found it to be higher), which may indicate that the market anticipates firm distress or bankruptcy, lowering market value of equity and the market-to-book ratio, consequently. Finally, in terms of price per share, I find a similar mean ($7.88) to that Campbell et al. (2008) found but a considerably lower median. Since I also truncated the data on price at $15, I find the same maximum, but my minimum is much lower, being approximately $0. However, in Panel B I find a considerably higher mean price per share for my bankruptcy group ($5.99) than they did ($1.42), and a mean price per share of $1.42 for the period before the companies in my bankruptcy group filed or were delisted for bankruptcy. These values indicate that in my dataset

there were several firms that were doing well for some time in the financial markets before they had problems that resulted in a drop of their price per share and led them to file or be delisted for bankruptcy. Overall, I also find higher standard variances for the variables in this study than Campbell et al. (2008) did, with the only exception being in terms of firm size, which illustrates the presence of much more varied firms in my dataset with regard to how companies perform financially.

5. Main Results

This section presents the results of the panel pooled OLS logit regressions for Model 1 and Model 2. In the output tables are included coefficients, robust standard errors, z-values and p-values (as well as margins sub-tables for the interpretation of the variable gender) for all explanatory and control variables, except for year effects, for clarity reasons (the full table including these can be found in the Appendix).

Table 10 reports the results for the pooled OLS logit regression, using panel data, with clustering of standard errors, of the bankruptcy indicator for Model 1, which includes GNDR, NITA, TLTA, EXRET, RSIZE and SIGMA as main explanatory variables, in columns 1 to 4, and Model 2, which includes GNDR, NIMTA, TLMTA, EXRET, RSIZE, SIGMA, CASHMTA, MB and PRICE as main explanatory variables, in columns 5 to 8.

For both models, I find statistically significant results for the impact of gender on the probability of a firm filing or being delisted for bankruptcy. For Model 1, I find statistical significance at a 1% level for GNDR, and from the margin obtained it can be concluded that, everything else constant, a firm with female CEOs or CFOs is only 0.019 percentage points more likely to file or be delisted for bankruptcy than a firm with only men in these positions. For Model 2, I find statistical significance at a 5% level for GNDR, and, likewise, from the margin obtained it can be concluded that, everything else constant, a firm with female CEOs or CFOs is only 0.007

percentage points more likely to file or be delisted for bankruptcy than a firm with only men in these positions. Thus, I conclude that gender has little to no effect on firm creditworthiness.

Table 2 – Panel Logit Regressions of the Bankruptcy Indicator

This table displays results from panel logit regressions of the bankruptcy indicator on predictor variables, with these being observable at the beginning of the quarter over which bankruptcy filing and delisting is measured. The full table including the coefficients for the year dummies can be found in Appendix B. * signifies significance at a 10% level, ** signifies significance at 5% level and *** signifies significance at 1% level.

	Model 1				*Model 2*			
BNKR1	Coef.	Robust Std. Error	z	P > |z|	Coef.	Robust Std. Error	z	P > |z|
GNDR	0.63	0.24	2.58***	0.01	0.56	0.24	2.37**	0.02
NITA	–0.00	0.32	–0.00	1.00				
NIMTA					–7.61	0.79	–9.63***	0.00
TLTA	2.30	0.24	9.76***	0.00				
TLMTA					5.25	0.51	10.39***	0.00
EXRET	–4.49	0.62	–7.24***	0.00	–3.21	0.57	–5.61***	0.00
RSIZE	–0.51	0.08	–6.42***	0.00	–0.38	0.10	–3.83***	0.00
SIGMA	0.04	0.11	0.34	0.74	0.17	0.11	1.56	0.12
CASHMTA					0.34	0.60	0.56	0.57
MB					–0.04	0.05	–0.89	0.37
PRICE					0.05	0.03	1.39	0.16
Control v.								
CNTR	1.28	0.32	3.93***	0.00	1.40	0.32	4.32***	0.00
IND	–0.01	0.03	–0.35	0.72	0.03	0.03	1.00	0.32
Constant	–14.63	0.84	–17.48***	0.00	–16.56	1.09	–15.18***	0.00
Obs.	233,649				233,125			
LR chi2	988.02				870.13			
Prob>chi2	0.0000				0.0000			
Pseudo-R2	0.1690				0.2360			
Margins	dydx	Delta-met. Std. Error	z	P > |z|	dydx	Delta-met. Std. Error	z	P > |z|
GNDR	0.00019	0.00007	2.59***	0.01	0.00007	0.00003	2.22**	0.03

Regarding the explanatory variables proposed by Campbell et al. (2008), I find, as expected, a stronger predictive power from the market measures of profitability and leverage, in Model 2. From the remaining explanatory variables, only excess returns and firm size display statistically significant results. However, including the remaining variables seems to increase the explanatory power of the model. In terms of the measures of profitability, the negative coefficients found for NITA and NIMTA indicate that the higher the net income of a company, the less likely is this company to file or be delisted for bankruptcy. In terms of the measures of

leverage, I find strongly significant positive coefficients both for TLTA and TLMTA, indicating that the higher the leverage of a company, the more likely is this company to file or be delisted for bankruptcy. Excess returns and firm size relative to the S&P500 also exhibit statistically significant negative coefficients (at a 1% level) in both models, indicating that the higher the excess returns and firm size, the lower is the likelihood of a firm filing or being delisted for bankruptcy. In comparison with the results by Campbell et al. (2008), I would expect the sign of the coefficient of RSIZE to change to positive upon the inclusion of PRICE, due to the correlation between market capitalization and price per share. However, since price per share does not display a negative coefficient as expected, it seems natural that RSIZE does not compensate for this either, contrary to what happens to in their paper. SIGMA displays the expected coefficient sign, but no significance in either model. I believe this might happen due to the low frequency of the data used to calculate this variable. Finally, both cash and short-term investment (CASHMTA) and market-to-book (MB) display coefficients with the opposite signs to what I would expect from the paper by Campbell et al. (2008), but both with no statistical significance. The negative coefficient for MB seems to indicate that the market anticipates the filings and delisting for bankruptcy, since the lower is this ratio, the higher is the probability of a firm filing or being delisted for bankruptcy.

As for the control variables, I find for both models that country displays statistically significant coefficients at a 1% level, while the results for industry display no statistical significance at all. I also find positive and statistically significant coefficients for the years of 2008, 2009 and 2015 in Model 1 and for the years 2009, 2010 and 2015 in Model 2, which might indicate that the impact of the market variables might be observed with a short delay.

6. Discussion

The results for the panel logit regressions for bankruptcy reveal with strong significance for the first model and some significance for the second that gender has an extremely small, positive impact on probability of default. These results lead me to conclude that the answer to my research question should be that presence of female CEOs or CFOs has little to no impact on firm creditworthiness and, as such, firm creditworthiness should not be indicated as a possible explanation for the lack of women in top executive positions. Furthermore, I find that, in accordance to the findings in Campbell et al. (2008), the market measures for profitability and leverage are better predictors of likelihood of bankruptcy than their book equivalents, and that excess returns and firm size are also strongly significant predictors of probability of bankruptcy, while the results for all other variables were insignificant.

Overall, I conclude with strong significance that the presence of a female CEO or CFO, all else equal, has almost no impact on the likelihood of a firm filing or being delisted for bankruptcy. Thus, firm creditworthiness, judged based on top executive gender, should not be a reason for the lack of women is top executive positions. Furthermore, the small impact found also suggests that there is no evidence that women will take on more or less risk-averse behaviour. Therefore, in situations such as when seeking loans, the same base contractual conditions should be given to female and male top executives, based on *a-priori* default risk that might be deduced from soft information. This study also reports that a quarter before a bankruptcy occurs, there are clear accounting and market indicators that a firm might be in distress.

7. Conclusion

This thesis contributes academically to the literature on finance and business gender studies by examining the relationship between top executive gender and credit risk, through the estimation of probability of filing or being delisted for bankruptcy, for publicly quoted firms. To do so, I

create two different specifications for a logit model to predict bankruptcy likelihood based on the work done by Campbell, Hilscher and Szilagyi (2008). This study is executed for North American firms, for the decade immediately following the financial crisis of 2007, which resulted in a significant increase in the number of bankruptcies worldwide.

Regarding the extension of the paper by Campbell et al. (2008) to the last decade, I find some surprising results. On the one hand, the results I find also show that the market measures of profitability and leverage are better predictors of bankruptcy probability than the same book measures, and they consistently indicate that the market measures for profitability and leverage, excess returns and firm size are significant predictors of likelihood of filing or being delisted for bankruptcy. On the other hand, in the panel logit regressions on bankruptcy, although they increase the predictive power of the models, I find only insignificant results for stock price volatility, cash and short-term investments, market-to-book ratio and log price per share, with these last three even displaying opposite coefficients signs to the signs expected. However, when running univariate regressions on bankruptcy for each of these variables, the coefficients display the expected signs, which leads me to believe the coefficients of these variables in the multivariate regression are compensating for the addition of other variables.

Nevertheless, the results regarding the main research question match mostly what would be expected. The outcome of the panel logit regression on bankruptcy with the first model suggests with strong statistical significance that, all else constant, the presence of a female top executive leads to an increase of 0.019 percentage points in the probability of a firm filing or being delisted for bankruptcy, which can hardly be classified as a meaningful impact. And the results of the panel regression on bankruptcy with the second model indicate with statistical significance at a 5% level that, all else constant, the presence of a female top executive leads to an increase of 0.007 percentage points in the probability of a firm filing or being delisted for

bankruptcy, which again is not a telling effect. Thus, I conclude that CEO or CFO gender has scarcely any impact on the likelihood of bankruptcy.

Overall, this study suggests that, all else constant, top executive gender has little impact on the likelihood of a firm filing or being delisted for bankruptcy. But there are some limitations to it. For instance, the lack of significance displayed in the results of some explanatory variables indicates that future research should perhaps consider other accounting variables and financial ratios (such as a turnover ratio) as explanatory variables to predict bankruptcy probability. Furthermore, it would also be interesting to carry a gender study on credit risk for publicly quoted firms based on the loan default. This information, however, is mostly confidential and hard to find. Lastly, this study focuses on North American firms but could give valuable insights for a similar study carried for European or Asian firms.

References

Adams, Renée B., and Ferreira, Daniel. 2009. "Women in the boardroom and their impact on governance and performance." *Journal of Financial Economics*, 94(2): 291-309.

Adams, Renée B., and Funk, Patricia. 2012. "Beyond the glass ceiling: Does gender matter?" *Management science*, 58(2): 219-235.

Agier, Isabelle, and Szafarz, Ariane. 2010. "Credit to Women Entrepreneurs: The Curse of the Trustworthier Sex." Accessed September 20. https://ssrn.com/abstract=1718574

Ahern, Kenneth R., and Dittmar, Amy K. 2012. "The changing of the boards: The impact on firm valuation of mandated female board representation." *The Quarterly Journal of Economics*, 127(1): 137-197.

Allison, Paul D. 2009. "Fixed effects regression models." (Vol. 160). SAGE publications.

Altman, Edward I. 1968. "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy." *Journal of Finance*, 23(4): 589-609.

Bandura Albert. 1977. “Social learning theory.” Englewood Cliffs. NJ: Prentice-Hall.

Berger, Allen N., Kick, Thomas, and Schaeck, Klaus. 2014. “Executive board composition and bank risk taking.” *Journal of Corporate Finance*, 28: 48-65.

Borghans, Lex, Heckman, James J., Golsteyn, Bart H. H., and Meijers, Huub. 2009. “Gender differences in risk aversion and ambiguity aversion.” *Journal of the European Economic Association*, 7(2-3): 649-658.

Bussey, Kay, and Bandura, Albert. 1999. “Social cognitive theory of gender development and differentiation.” *Psychological Review*, 106(4): 676-713.

Campbell, John, Hilshcher, Jens, and Szilagyi, Jan. 2008. “In Search of Distress Risk.” *Journal of Finance*, 63(6): 2899-2939.

Carter, Sara, Shaw, Eleanor, Lam, Wing, and Wilson, Fiona. 2007. “Gender, entrepreneurship, and bank lending: The Criteria and processes used by bank loan officers in assessing applications.” *Entrepreneurship Theory and Practice*, 31(3): 427-444.

Carvalho, Paulo V., Laux, Paul, and Pereira, João P. 2015. “Credit ratings agencies: analysts or coordinators?” Accessed September 24. http://thefinanceworks.net/laux/CreditRatings.pdf

Castillo, José, Mora-Valencia, Andrés, and Perote, Javier. 2017. “Moral hazard and default risk of SMEs with collateralized loans.” *Finance Research Letters*, 3(3).

Charness, Gary, and Gneezy, Uri. 2012. “Strong evidence for gender differences in risk taking.” *Journal of Economic Behavior and Organization*, 83(1): 50-58.

Chava, Sudheer, and Jarrow, Robert A. 2004. “Bankruptcy prediction with industry effects.” *Review of Finance*, 8(4): 537-569.

Cohen, Randolph B., Polk, Christopher, and Vuolteenaho, Tuomo. 2003. “The value spread.” *Journal of Finance*, 58: 609-641.

Eckel, Catherine C., and Grossman, Philip J. 2002. “Sex differences and statistical stereotyping in attitudes toward financial risk.” *Evolution and Human Behavior*, 23(4): 281-295.

Erhardt, Niclas L., Werbel, James D., and Shrader, Charles B. 2003. "Board of Director Diversity and Firm Financial Performance." *Corporate governance: An international review,* 11(2): 102-111.

Faccio, Mara, Marchica, Maria-Teresa, and Mura, Roberto. 2016. "CEO gender, corporate risk-taking, and the efficiency of capital allocation." *Journal of Corporate Finance,* 39: 193-209.

Fortune. 2017. "The 2017 Fortune 500 includes a record number of women CEOs." Accessed November 5. http://fortune.com/2017/06/07/fortune-women-ceos/

Francis, Bill, Hasan, Iftekhar, Park, Jong C., and Wu, Qiang. 2015. "Gender differences in financial reporting decision making: Evidence from accounting conservatism." *Contemporary Accounting Research*, 32(3): 1285-1318.

Francis, Bill, Hasan, Iftekhar, and Wu, Qiang. 2013. "The impact of CFO gender on bank loan contracting." *Journal of Accounting, Auditing & Finance*, 28(1): 53-78.

Gneezy, Uri, Niederle, Muriel, and Rustichini, Aldo. 2003. "Performance in competitive environments: Gender differences." *The Quarterly Journal of Economics*, 118(3): 1049-1074.

Huang, Jiekun, and Kisgen, Darren J. 2013. "Gender and corporate finance: Are male executives overconfident relative to female executives?" *Journal of Financial Economics*, 108(3): 822-839.

Jianakoplos, Nancy A., and Bernasek, Alexandra. 1998. "Are women more risk averse?" *Economic Inquiry*, 36(4): 620-630.

Kambil, Ajit, and Larson, Carol. 2017. "Journey to CFO: What's changed for women in 2017?" Deloitte. Accessed December 8. https://www2.deloitte.com/us/en/pages/finance/articles/cfo-insights-women-cfos.html

Keasey, Kevin, and Watson, Robert. 1987. "Non-Financial Symptoms and the Prediction of Small Company Failure: A Test of Argenti's Hypotheses." *Journal of Business Finance & Accounting*, 14(3): 335-354.

Kim, Moshe, Surroca, Jordi, and Tribó, Josep A. 2014. "Impact of ethical behavior on syndicated loan rates." *Journal of Banking & Finance*, 38: 122-144.

Reuters. 2015. "U.S. public companies seek bankruptcy at fastest first-quarter rate since 2010." Accessed November 7. https://www.reuters.com/article/us-usa-bankruptcy-increase-insight/u-s-public-companies-seek-bankruptcy-at-fastest-first-quarter-rate-since-2010-idUSKBN0N528K20150414

Robb, Alicia M., and Watson, John. 2012. "Gender differences in firm performance: Evidence from new ventures in the United States." *Journal of Business Venturing*, 27(5): 544-558.

Shumway, Tyler. 2001. "Forecasting bankruptcy more accurately: A simple hazard model." *Journal of Business*, 74(1): 101-124.

Thomas, Rachel, Cooper, Marianne, Konar, Ellen, Rooney, Megan, Finch, Ashley, Yee, Lareina, Krivkovich, Alexis, Starikova, Irina, Robinson, Kelsey, and Valentino, Rachel. 2017. "Women in Workplace 2017" LeanIn.Org and McKinsey & Company. Accessed December 8. https://www.mckinsey.com/global-themes/gender-equality/women-in-the-workplace-2017

Tienari, Janne, Meriläinen, Susan, Holgersson, Charlotte, and Bendl, Regine. 2013. "And then there are none: on the exclusion of women in processes of executive search." *Gender in Management: An International Journal*, 28(1): 43-62.

Vähämaa, Emilia. 2014. "Executive turnover, gender, and earnings management: An explanatory analysis." *Accounting Perspectives*, 13(2): 103-122.

Appendix

Appendix A – Variables Construction

In this appendix, I show how the explanatory variables were constructed, following Campbell et al. (2008), for which COMPUSTAT and DATASTREAM data was used. The accounting ratios are thus defined:

- standard/book measure of profitability:

$$\boldsymbol{NITA_{i,t}} = \frac{\boldsymbol{Net\ Income_{i,t}}}{\boldsymbol{Total\ Assets\ (adjusted)_{i,t}}}, \tag{3}$$

- market measure of profitability:

$$\boldsymbol{NIMTA_{i,t}} = \frac{\boldsymbol{Net\ Income_{i,t}}}{(\boldsymbol{Firm\ Market\ Equity_{i,t}} + \boldsymbol{Total\ Liabilities_{i,t}})}, \tag{4}$$

- standard/book measure of leverage:

$$\boldsymbol{TLTA_{i,t}} = \frac{\boldsymbol{Total\ Liabilities_{i,t}}}{\boldsymbol{Total\ Assets\ (adjusted)_{i,t}}}, \tag{5}$$

- market measure of leverage:

$$\boldsymbol{TLMTA_{i,t}} = \frac{\boldsymbol{Total\ Liabilities_{i,t}}}{(\boldsymbol{Firm\ Market\ Equity_{i,t}} + \boldsymbol{Total\ Liabilities_{i,t}})}, \tag{6}$$

- measure of liquidity:

$$\boldsymbol{CASHMTA_{i,t}} = \frac{\boldsymbol{Cash\ and\ Short\ Term\ Investments_{i,t}}}{(\boldsymbol{Firm\ Market\ Equity_{i,t}} + \boldsymbol{Total\ Liabilities_{i,t}})}, \tag{7}$$

- the market-to-book ratio (MB).

The adjustment of the value of total assets is given by

$$\boldsymbol{Total\ Assets\ (adjusted)_{i,t} = TA_{i,t} + 0.1\left(ME_{i,t} - BE_{i,t}\right)}, \quad (8)$$

The following market based variables are also calculated:

- the quarterly log excess return on equity of each firm relative to the S&P500 index:

$$\boldsymbol{EXRET_{i,t} = \log\left(1 + R_{i,t}\right) - \log\left(1 + R_{S\&P500,t}\right)}, \quad (9)$$

- the relative size of each firm relative to the S&P500 index:

$$\boldsymbol{RSIZE_{i,t} = \log\left(\frac{Firm\ Market\ Equity_{i,t}}{Total\ S\&P500\ Market\ Value_t}\right)}, \quad (10)$$

- the log price per share of each firm, truncated above at 15$ (PRICE),
- the standard deviation of each firm (SIGMA).

Appendix B – Chi-Square Test of Independence

I perform a secondary study and test 4 main hypotheses of statistical relationships between two variables used in the main study, dividing my first hypothesis in two separate sub-hypotheses and my fourth hypothesis in four separate sub-hypotheses. I do so using the Chi-Square test of independence, which tests whether there is a significant relationship between two categorical variables. The null hypothesis for this test states that there is no association between the variables.

My main hypotheses and sub-hypotheses are the following:

- Hypothesis 1: Bankruptcy and gender have a statistically significant relationship;
    - Hypothesis 1.1: Bankruptcy and gender have a statistically significant relationship in the period of filing or delisting for bankruptcy;
    - Hypothesis 1.2: Bankruptcy and presence of a female top executive at any point in time have a statistically significant relationship;
- Hypothesis 2: Bankruptcy and industry have a statistically significant relationship;
- Hypothesis 3: Gender and industry have a statistically significant relationship;
- Hypothesis 4: Bankruptcy and crisis and post-crisis years have a statistically significant relationship;
    - Hypothesis 4.1: Bankruptcy and 2007 have a statistically significant relationship;
    - Hypothesis 4.2: Bankruptcy and 2008 have a statistically significant relationship;
    - Hypothesis 4.3: Bankruptcy and 2009 have a statistically significant relationship;

- Hypothesis 4.4: Bankruptcy and 2010 have a statistically significant relationship.

Table 3 displays the results of the Chi-Square test of independence for hypotheses 1.1 and 1.2, in Panel A and Panel B, respectively. I reject the null for hypothesis 1.1, concluding that there is a statistically significant relationship between bankruptcy filing or delisting and the gender of top executives in the period of filing or delisting. However, I find no statistically significant relationship between bankruptcy filing or delisting and a firm having employed at least a female top executive at some point in time.

Table 3 – Chi-Square Test of Independence for Hypotheses 1.1 and 1.2

This tables displays the results of tabulating and performing the Chi-Square test of independence for the relationships between bankruptcy and CEO or CFO gender in the period before a bankruptcy and between bankruptcy and the presence of a female top executive at some point in time.

Panel A				Panel B			
	GNDR				FEMALE		
BNKR1	0	1	Total	BNKR1	0	1	Total
0	207,312	20,259	317,571	0	280,093	47,498	327,591
1	232	27	259	1	238	35	273
Total	297,544	20,286	317,830	Total	280,331	47,533	327,864
Pearson chi2(1) = 7.0876		Pr = 0.008		Pearson chi2(1) = 0.6201		Pr = 0.431	

Table 4 allows me to withdraw conclusions on hypotheses 2 and 3, and the results of the Chi-Square test of independence indicate that the null hypothesis should be rejected for both hypotheses. That is, I find a statistically significant relationship both between bankruptcy filing or delisting and industry, and between CEO or CFO gender and industry, indicating that some industries are more susceptible to distress and to have top executives of a gender or another.

Table 5 illustrates the results of the Chi-Square test of independence for hypotheses 4.1, 4.2, 4.3 and 4.4. As expected, I reject the null for hypotheses 4.1, 4.2 and 4.3 and find a significant statistically relationship between bankruptcy filing and delisting and the years 2007, 2008 and 2009 (that is, the crisis year and the immediate post-crisis years) but find no statistically

significant relationship between bankruptcy filing or delisting and the year 2010. These findings support the strong impact of the crisis on the bankruptcy of many firms.

Table 4 – Chi-Square Test of Independence for Hypotheses 2 and 3

This tables displays the results of tabulating and performing the Chi-Square test of independence for the relationships between bankruptcy and industry and between gender and industry.

	IND					
BNKR1	Agriculture	Construct.	Finance	Manufact.	Mining	Total
0	1,136	2,811	67,299	107,633	51,239	327,591
1	1	7	47	84	47	273
Total	1,137	2,818	67,346	107,717	51,286	327,864

	IND					
BNKR1	Nonclassif.	Retail Tr.	Services	Transport	Wholesale	Total
0	5,821	12,963	47,207	23,700	7,782	327,591
1	7	19	39	21	1	273
Total	5,828	12,982	47,246	23,721	7,783	327,864

Pearson chi2(9) = 23.3868 Pr = 0.005

	IND					
GNDR	Agriculture	Construct.	Finance	Manufact.	Mining	Total
0	1,077	2,662	62,100	100,694	49,717	306,492
1	54	161	5,254	7,052	1,294	21,151
Total	1,131	2,823	67,354	107,746	51,011	327,643

	IND					
GNDR	Nonclassif.	Retail Tr.	Services	Transport	Wholesale	Total
0	5,546	11,780	43,750	22,085	7,081	306,492
1	262	1,251	3,439	1,702	682	21,151
Total	5,808	13,031	47,189	23,787	327,643	327,643

Pearson chi2(9) = 1.9e+03 Pr = 0.000

Table 5 – Chi-Square Test of Independence for Hypotheses 4.1, 4.2, 4.3 and 4.4

This tables displays the results of tabulating and performing the Chi-Square test of independence for the relationships between bankruptcy and the crisis and post-crisis years (2007, 2008, 2009 and 2010).

	SEVEN		
BNKR1	0	1	Total
0	293,395	34,196	327,591
1	264	9	273
Total	293,659	34,205	327,864

Pearson chi2(1) = 14.8897 Pr = 0.000

	EIGHT		
BNKR1	0	1	Total
0	294,388	33,203	327,591
1	224	49	273
Total	294,612	33,252	327,864

Pearson chi2(1) = 18.2717 Pr = 0.000

	NINE		
BNKR1	0	1	Total
0	294,986	32,605	327,591
1	216	57	273
Total	295,202	32,662	327,864

Pearson chi2(1) = 36.3046 Pr = 0.000

	TEN		
BNKR1	0	1	Total
0	295,037	32,554	327,591
1	246	27	273
Total	295,283	32,581	327,864

Pearson chi2(1) = 0.0007 Pr = 0.979

The results of the Chi-Squared test of independence indicate that the presence of a female top executive in the period before there is a filing or a delisting for bankruptcy might be associated with this happening, but find no relationship between presence of female top executive at some point in time and bankruptcy. This indicates that while gender of top executives might impact and lead to different firm performances, these differences are not long-lasting and, on a whole, do not lead to bankruptcy. Moreover, the Chi-Square test also indicates there is a strongly significant relationship between bankruptcy filing or delisting and industry, as well as between gender and industry, which shows that firms of certain industries are more susceptible to bankruptcy risk during the period studied (2007 to 2016) and that there is clear predominance of certain genders on particular industries. The significant results for this latter relationship also illustrate the possibility of a reverse causation and justify my choice for a pooled OLS model instead of one with fixed-effects specifications that would be unable to control for this bias. Lastly, the Chi-Square test also demonstrates the impact the crisis had on the number of bankruptcies, with the year of the crisis (2007) and the years succeeding it (2008 and 2009) displaying strongly significant relationships with the filing and delisting for bankruptcy.

Appendix C – Stata Code

```
* MASTER THESIS
* Top executive gender and credit risk
* Sofia Curado – December 2017

* PANEL DATA STATISTICS, TESTS AND REGRESSIONS

* Data
use "C:\Users\SofiaPC\paneldatafile.dta", clear

* Variables
encode country, gen(CNTR)
drop country
encode industry, gen(IND)
drop industry
destring NITA, replace
destring NIMTA, replace
destring TLTA, replace
destring TLMTA, replace
destring EXRET, replace
destring RSIZE, replace
destring SIGMA, replace
destring CASHMTA, replace
destring MB, replace
destring PRICE, replace
rename bankruptcy_dummy BNKR
rename gender_dummy GNDR
destring BNKR, replace
destring GNDR, replace
destring FEMALE, replace
gen BNKR1 = BNKR[_n+1]

* Summary Statistics for Explanatory Variables
summarize GNDR NITA NIMTA TLTA TLMTA EXRET RSIZE SIGMA CASHMTA MB PRICE
** Detailed Summary Statistics
summarize GNDR NITA NIMTA TLTA TLMTA EXRET RSIZE SIGMA CASHMTA MB PRICE, detail

* Testing for statistical relationships

** Hypotheses 1.1 and 1.2
tabulate bnkr1 gndr, chi2
tabulate bnkr1 female, chi2
** Hypothesis 2
tabulate bnkr1 ind, chi2
** Hypothesis 3
tabulate gndr ind, chi2
** Hypotheses 4.1, 4.2, 4.3 and 4.4
tabulate bnkr1 seven, chi2
tabulate bnkr1 eight, chi2
tabulate bnkr1 nine, chi2
tabulate bnkr1 ten, chi2

* Logit Regressions

* MODEL 1

global id id
global t t
global ylist BNKR1
global xlist GNDR NITA TLTA EXRET RSIZE SIGMA

describe $id $t $ylist $xlist
summarize $id $t $ylist $xlist
```

```
** Set data as panel data
sort $id $t
xtset $id $t
xtdescribe
xtsum $id $t $ylist $xlist

** Regressions and tests
*** Fixed effects logit regression
xtlogit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, fe nolog
di e(r2_p)
estimate store fe
*** Random effects logit regression
xtlogit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, re nolog
di e(chi2)
estimate store re
*** Hausman test comparing FE and RE
hausman fe re
*** Logit regression with vce cluster
logit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, vce(cluster id) nolog
margins, dydx(GNDR) atmeans

* MODEL 2

global id id
global t t
global ylist BNKR1
global xlist GNDR NIMTA TLMTA EXRET RSIZE CASHMTA MB PRICE SIGMA

describe $id $t $ylist $xlist
summarize $id $t $ylist $xlist

** Set data as panel data
sort $id $t
xtset $id $t
xtdescribe
xtsum $id $t $ylist $xlist

** Regressions and tests
*** Fixed effects logit regression
xtlogit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, fe nolog
di e(r2_p)
estimate store fe2
*** Random effects logit regression
xtlogit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, re nolog
di e(chi2)
estimate store re2
*** Hausman test comparing FE and RE
hausman fe2 re2
*** Logit regression with vce cluster
logit $ylist $xlist CNTR IND SEVEN EIGHT NINE TEN ELEVEN TWELVE THIRTEEN FOURTEEN
FIFTEEN, vce(cluster id) nolog
margins, dydx(GNDR) atmeans
```

Appendix D – Full Table

Table 6 – Full Panel Logit Regressions of the Bankruptcy Indicator

This table displays results from panel logit regressions of the bankruptcy indicator on predictor variables, with these being observable at the beginning of the quarter over which bankruptcy filing and delisting is measured. * signifies significance at a 10% level, ** signifies significance at 5% level and *** signifies significance at 1% level.

	Model 1				*Model 2*			
BNKR1	Coef.	Robust Std. Error	z	P > |z|	Coef.	Robust Std. Error	z	P > |z|
GNDR	0.63	0.24	2.58***	0.01	0.56	0.24	2.37**	0.02
NITA	–0.00	0.32	–0.00	1.00				
NIMTA					–7.61	0.79	–9.63***	0.00
TLTA	2.30	0.24	9.76***	0.00				
TLMTA					5.25	0.51	10.39***	0.00
EXRET	–4.49	0.62	–7.24***	0.00	–3.21	0.57	–5.61***	0.00
RSIZE	–0.51	0.08	–6.42***	0.00	–0.38	0.10	–3.83***	0.00
SIGMA	0.04	0.11	0.34	0.74	0.17	0.11	1.56	0.12
CASHMTA					0.34	0.60	0.56	0.57
MB					–0.04	0.05	–0.89	0.37
PRICE					0.05	0.03	1.39	0.16
Control v.								
CNTR	1.28	0.32	3.93***	0.00	1.40	0.32	4.32***	0.00
IND	–0.01	0.03	–0.35	0.72	0.03	0.03	1.00	0.32
SEVEN								
EIGHT	0.64	0.37	1.72*	0.09	0.32	0.38	0.86	
NINE	1.44	0.35	4.10***	0.00	1.18	0.35	3.36***	
TEN	0.59	0.39	1.52	0.13	0.65	0.39	1.66*	
ELEVEN	0.48	0.40	1.20	0.23	0.52	0.40	1.29	
TWELVE	0.44	0.43	1.13	0.26	0.43	0.39	1.11	
THIRTEEN	0.04	0.38	0.08	0.93	0.18	0.43	0.41	
FOURTEEN	0.45	0.38	1.20	0.23	0.63	0.39	1.64	
FIFTEEN	0.65	0.37	1.77*	0.08	0.64	0.37	1.72	
Constant	–14.63	0.84	–17.48***	0.00	–16.56	1.09	–15.18***	0.00
Obs.	233,649				233,125			
LR chi2								
Prob>chi2								
Pseudo-R2	0.1690				0.2360			

Margins		Delta-met.				Delta-met.		
	dydx	Std. Error	Z	P > |z|	dydx	Std. Error	z	P > |z|
GNDR	0.00019	0.00007	2.59***	0.01	0.00007	0.00003	2.22**	0.03