The real effect of IFRS 16 Leases

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Name of student: Jamiro Sultan

Student number: 481278

Supervisor: S. Renes

Second assessor: W. Cao

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Abstract

IFRS 16 has been implemented after January 1, 2019, and obligates to capitalize operating leases on the balance sheet. As a result, a right to use assets (RUA) and a lease liability will be recognized. This research investigated the impact of IFRS 16 on the liquidity, solvability and profitability of the companies and if there is any impact will managers change the capital structure of the company. A Wilcoxon matched-pairs signed-rank test and an ordinary least squares regression will be performed to answer these questions. This study concludes that IFRS 16 deteriorates the liquidity and solvability of companies and this effect is more pronounced for lease intensive companies. However, no effect on the profitability ratios has been found. But the profitability measures EBITDA and EBIT significantly increased and also here the effect is more pronounced for the lease intensive companies. To mitigate these proposed effects, managers could respond to this by changing their leasing behaviour, debt level or equity level. This study finds a positive significant effect of RUA on the unexpected lease change, so managers are still leasing. Another finding is that managers are redeeming more debt than issuing debt because a negative significant effect of RUA on the change in debt has been found. In addition, this effect is more pronounced for the lease intensive sectors. However, managers are not changing their equity level.

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1. Introduction

On the first of January 2019, public listed companies had to apply the new International Financial Reporting Standard (IFRS) 16 Leases in their annual report. Before this date, the public listed companies applied International Accounting Standard (IAS) 17 for lease accounting. In IAS 17 there was a distinction between financial and operational leases. Financial leases had to be activated on the balance sheet, whereas operational leases had to be disclosed in the footnotes. But with IFRS 16 this distinction will disappear and as a consequence, all lease contracts, financial as operational, have to be activated on the balance sheet, except for the short term leases and the low-value leases (IASB, 2021a).

The financial statement has to present a true and fair view of the financial position, financial performance and cash flows of a company (IASB, 2021b). The International Accounting Standard Board (IASB) believed that with the old rules of lease accounting it can be difficult to get a proper overview of the assets and liabilities that will arise when companies engaged in lease contracts (IASB, 2021c). As a result, this can threaten the fair view of the financial statements. The application of IFRS 16 should lead to an improvement of the fair presentation of the financial statements and its transparency and comparability (Arnold & Tahtah, 2017).

To determine the possible effect of IFRS 16 on the financial statement, researchers often used operational lease capitalization. Díaz and Ramírez (2018a) investigated European public listed companies and analysed the possible impact of IFRS 16 on the balance sheet and financial metrics. They found a significant increase in total assets, total liabilities and leverage and a significant decrease in the interest coverage ratio. However, they found no significant effect on the profitability ratios. In addition, they concluded that the results were different depending on the sector a company operated. The hotel, transportation, retail and software and services sector were the sectors that were affected the most. Arnold and Tahtah (2017) concluded something similar. They investigated the Dutch public listed companies of the AEX and AMX index. Also, they found an increase in total assets and total liabilities. In addition, they concluded that earnings before interest, taxes, depreciation and amortization (EBITDA) and the debt-to-equity (D/E) ratio increased.

However, managers can mitigate the proposed effects of operational lease capitalization. Before the introduction of IFRS 16, managers tried to convert the financial leases into operational leases because of the accounting advantages (Díaz & Ramírez, 2018a). This is called the substitution effect. Goodacre (2003) advised managers to minimalize the effect of operational lease capitalization on the financial metrics with the substitution effect. But with IFRS 16 all lease contracts, operational as financial, will be treated the same. It could be possible that managers are now trying to engage more in lease contracts that have a low value or are short term related because these types of lease contracts are the exception to the rule.

In addition, Díaz and Ramírez (2018b) expect that companies will make decisions to decrease the effect of IFRS 16. For example, Abdel-Khalik (1981) suggested in his study that managers will make decisions to mitigate the leverage increasing effect of lease capitalization by increasing equity and decreasing conventional debt.

In this research, the real effect of IFRS 16 on the financial statement will be analysed. This lead to the following research question: *What is the impact of IFRS 16 Leases on the liquidity, solvability and profitability and if there is any impact do managers change the capital structure of the company?*

This research is scientifically relevant because all the research on this topic has been conducted before the introduction of IFRS 16. The method that previous researchers often used was operational lease capitalization by using the present value of the future lease payments. A disadvantage of this method is that it can have a too rough approach to determine the impact of IFRS 16 because it relies on several assumptions (Arnold & Tahtah, 2017). Also, the substitution effect is not taken into consideration in prior research, which can mitigate the proposed effects of IFRS 16. These limitations will be tackled in this study by looking at the effect of IFRS 16, without making assumptions and calculations to capitalize operational leases. In addition, possible capital structure changes will be observed in the first year of the post-adoption period. This combined will determine the real effect of IFRS 16 on the financial statement. This has never been done before in prior research because prior researchers had no access to the annual reports of 2019.

Furthermore, this research can be a contribution to society because the outcomes of this research can be taken into consideration in evaluating IFRS 16. Based on the outcomes, regulators can better understand the consequences of the new standard and could ask themselves if the new standard was really necessary or had a contribution. In addition, stakeholders can make a more informed decision when the financial statement is a more true and fair view of the economic position of the company if the application of IFRS 16 has a significant impact on the financial statement.

To answer the research question data will be collected by hand by looking at the financial statements of European public listed companies from the Netherlands, Belgium, Germany and France. By performing a Wilcoxon matched-pairs signed-rank test, this study tries to find the impact of IFRS 16 on certain financial metrics. In addition, an ordinary least squares regression will be performed to identify any substitution effects.

It has been found that the implementation of the new leasing standard IFRS 16 deteriorates the liquidity and solvability of the companies and increases the profitability measured as EBITDA and EBIT. These effects are more pronounced for lease intensive firms. However, no effect on the profitability ratios has been found. To mitigate the observed effects, this study found a negative significant effect of the RUA on the change in debt. So companies,

and especially lease intensive companies, are redeeming more debt than issuing debt in the first year of the post-adoption period. Nevertheless, companies are still leasing as this research observed a positive significant effect of the RUA on the unexpected lease change. But managers are not changing their equity level as no significant effect have been found of the RUA on the change in equity.

In summary, the IASB can be satisfied with the outcomes of the new standard. Despite the negative impact on liquidity and solvability, companies are still leasing and retiring more debt. Furthermore, the financial statement will be a more true and fair view of the economic position of the company due to IFRS 16. Before the introduction of IFRS 16 companies could engage in (operational) leased assets that had not to be recognized on the balance sheet. As a result, an aeroplane company that leased their aeroplanes on an operational level was not comparable to an aeroplane company that owned their aeroplanes or leased on a financial level (Magli et al., 2018). This problem will disappear with IFRS 16, in which operational and financial leases will be treated the same. Furthermore, the results of this study showed that the liquidity and solvability ratios before and after IFRS 16 are not the same and deteriorate after the implementation of the new lease standard. So it seemed there was a distortion of these ratios before IFRS 16. This will also disappear with the new lease standard as all leased assets, except for the short term and low-value leases, will be recognized on the balance sheet and so no assets and liabilities will be hidden from stakeholders. As a result, stakeholders can make better decisions.

2. Literature review

2.1 IFRS 16

A lease is a contract where one party, the lessor, transfers the right to control the use of an identified asset for some time in return for a payment to another party, the lessee (IASB, 2021a). Before January 1, 2019, IAS 17 was the current lease accounting standard. IAS 17 made a distinction between a financial lease and an operational lease. With a financial lease, the lessor transfers the rewards and risks of ownership to the lessee. Also is the lease contract not terminable during the leasing period (IASB, n.d.). According to IAS 17, a lease will be classified as a financial lease if:

- The ownership of the leased asset will be transferred to the lessee by the end of the lease contract;
- The lessee has the right to buy the leased asset at the end of the lease term against a price that is lower than the fair value of the leased asset;
- The leasing period contains the biggest part of the economic life of the leased asset;
- The present value of the lease payments will equal the fair value of the leased asset;
- The leased asset is so specific, that its usage is only suitable for the lessee (IASB, n.d.).

As a result, the lessee recognizes the leased asset as an asset and the payments to the lessor as a liability on the balance sheet[1]. In addition, there will be depreciated over the term of the lease contract. Furthermore, the lessee will redeem some of the created debt and pay interest to the lessor. Under IAS 17, this was not the case with operational lease contracts. With an operational lease, the economic risks are not transferred to the lessee, so the lessor remains the owner of the leased asset. Because the lessee carries no economic risks, IAS 17 prohibits activating the leased asset on the balance sheet. Instead, the lessee only recognizes the lease payments as expenses on the income statement and discloses the amount of the future operating lease payments in the footnotes (IASB, n.d.).

But on January 1, 2019, and onwards the distinction between operational and financial lease contracts will disappear due to the new lease accounting standard, called IFRS 16. IFRS 16 requires to capitalize all leased assets, financial as operational, on the balance sheet against the present value of the lease payments. This new asset line item will be categorized as the *right to use assets* (RUA). Furthermore, the future obligated payments from the lease contracts will result in a debt for the lessee (IASB, 2021a). In addition, IFRS 16 changes the cost structure of companies that has a lot of operational leases. Similar to financial leases under IAS 17, the lessee has to recognize depreciation costs of the operational leased asset and interest costs of the operational lease obligation on the income statement. Only leases

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[1] This study focuses only on the perspective of the lessee and not of the lessor.

shorter than one year (short term leases) and leases less than 5000 dollars (low-value leases) are not activated on the balance sheet and are thus the exception to the rule (IASB, 2021a).

The objective of the IASB with the new lease standard is to resolve the criticism of the previous lease accounting model. The previous lease accounting model failed to meet the needs of the users of the financial statements. For example, information about operating leases lacked transparency. A lot of users were of opinion that the payments and assets provided by (operational) leasing should have been reflected on the balance sheet. As a result, they made adjustments to estimate for example the leverage. But they made the adjustments with limited information and often they were not capable to make the adjustments. The distinction between operating and financial leases created information asymmetry and as a consequence users were less able to make a funded investment decision. Furthermore, the existence of different accounting approaches for financial leasing and operating leasing meant that similar transactions could be treated differently. Also, it allowed managers to restructure the transactions to obtain a particular accounting outcome. In addition, it reduced the comparability of the financial statements (IASB, 2021c). For example, a company that owns the aircraft and a company that leases the aircraft under an operational lease contract are not comparable to each other because at one company the aircraft is activated on the balance sheet and at the other not (Magli et al., 2018). The IASB believes that IFRS 16 will result in a more true view of the lessee's assets and liabilities and so increase the transparency of a lessee's capital employed and leverage (IASB, 2021c).

2.2. Effect of IFRS 16

IFRS 16 creates a new line item on the balance sheet, namely the right to use assets. In this line item all the leased assets, operational as financial, will be stored except for the low-value leases and short term leases. A likely consequence of the new lease standard is that the assets will rise for companies with a lot of operational leases from January 1, 2019, and onwards. In addition, the future payments to the lessor will result in a debt for the lessee, so the lessee's liabilities will increase if the company had used a lot of operational leases. Arnold and Tahtah (2017) found that for the AEX and AMX companies in the Netherlands the assets will rise with 41 billion euros (4.5% increase), the liabilities will rise with 43 billion euros (14.6% increase) and the equity will decline with 2 billion euros (0.6% decrease) due to IFRS 16. Because the assets and liabilities will change due to the new leasing rules, this could affect the financial ratios of the company. But before you could determine this effect, researchers had to capitalize the operational leases, in which the amount of the operating lease payments was disclosed in the footnotes. Furthermore, researchers had to estimate the lease term and the discount rate to calculate the present value of the leased asset and the lease liability, because this kind of information was not available in the financial statements. Because this method relies on

several assumptions, it can have a too rough approach in determining the impact of IFRS 16 (Arnold & Tahtah, 2017).

2.2.1 Impact on liquidity

Durocher (2008) investigated 68 Canadian public listed companies and found that through operational lease capitalization the current ratio significantly decreased from 1.37 to 1.30. Furthermore, Bennet and Bradbury (2003) observed a stronger decrease of the current ratio from 2.12 to 1.81 for 38 public listed companies from New Zealand. However, Duke et al. (2009) made first a distinction between negative and positive firms to determine the effect of operational lease capitalization on the financial performance of the companies from the S&P 500 Index. The negative firms represent the firms that had a decreased effect on income due to capitalizing operational leases, and the positive firms represent the firms that had an income increasing effect. The researchers found that the current ratio for the negative as the positive firms decreased significantly with 14% and 11% in absolute terms. The current ratio will probably decrease due to the new lease standard because the level of the current assets will remain the same (the nominator), whereas the current liabilities will increase due to the obligation of future lease payments within a year to the lessor (the denominator). In addition, the decreasing effect on the current ratio will probably be more pronounced for lease intensive sectors, because Díaz and Ramírez (2018a) found that the impact of operational lease capitalization on financial ratios is higher in sectors with a high level of leasing in comparison with sectors that are less lease intensive. The on-balance sheet reporting of operating leases will probably be bigger for companies with a lot of operating leases and so the impact on financial metrics. Within this context, the following two hypotheses will be tested:

Hypothesis 1: IFRS 16 will decrease the liquidity of the companies.
Hypothesis 2: The liquidity of the companies which have a high lease intensity will decrease more than the companies which are less lease intensive.

2.2.2 Impact on solvability

Díaz and Ramírez (2018a) analysed the probable effect of IFRS 16 on key ratios for the European quoted companies. They found that leverage, measured as debt divided by equity, increased significantly by 32.1% after the operational lease capitalization. Furthermore, Duke et al. (2009) concluded that the debt to equity ratio will significantly increase with 40% and 41% (in absolute terms) for the negative and positive firms. The D/E ratio will probably increase due to the new leasing rules because the discounted value of the future payments to the lessor will be recognized as a liability. As a consequence the level of debt will increase, which is the numerator in the D/E ratio. In addition, Arnold & Tahtah (2017) observed that the level of equity

will decrease due to the operational lease capitalization, which will result in a decrease in the denominator. Also, the leverage, measured as debt divided by total assets, increased significantly by 9.3% (Díaz & Ramírez, 2018a). Durocher (2008) found that the debt to asset (D/A) ratio significantly increased by 2.7% in absolute terms. In addition, Duke et al. (2009) concluded that the D/A ratio significantly increased by 3% and 2% (in absolute terms) for the negative and positive firms. The D/A ratio will probably increase because, as mentioned before, the level of debt will increase by recognizing the discounted value of the future lease payments as a liability. This will increase the nominator. However, the denominator, which is the level of total assets, will also increase because the operational leased asset will be activated on the balance sheet. But probably the level of debt will increase more than the level of assets, which is also observed by previous researchers. Arnold and Tahtah (2017) found that the assets increased by 4,5% and the liabilities by 14.6%. In addition, Díaz and Ramírez (2018a) observed that the assets increased approximately by 10% and the liabilities by 21.4%. Furthermore, Díaz and Ramírez (2018a) concluded that the impact of operational lease capitalization is more pronounced for sectors with a high lease intensity. They observed for example for the retailing sector, which is a sector with a high lease intensity, a much higher significant increase of the D/A ratio (23.4%) in comparison with the full sample (9.3%). Based on the literature, the following two hypotheses will be tested:

Hypothesis 3: IFRS 16 will decrease the solvability of the companies.
Hypothesis 4: The solvability of the companies which have a high lease intensity will decrease more than the companies which are less lease intensive.

2.2.3 Impact on profitability

Díaz and Ramírez (2018a) found an increase of 3.1% for the return on assets (ROA) after operational lease capitalization, but this increase was not significant. Also, Durocher (2008) concluded an insignificant increase for the ROA. However, Bennet and Bradbury (2003) observed a decrease of 0.13 to 0.12. In addition, Fülbier et al. (2008) concluded a negative significant effect of 1.3% for a sample of 90 German public listed companies. Furthermore, Duke et al. (2009) found that the ROA for the negative firms decreased significantly with 0.0047 and increased significantly with 0.11 for the positive firms. In conclusion, the existing literature doesn't give a clear effect of operational lease capitalization on the ROA. An explanation for this is that the ROA can be formulated in various ways, which can lead to different interpretations of the profitability of companies (Jewell & Mankin, 2011). Another explanation for the ambiguous effect could be that often researchers did not split firms into negative firms and positive firms, which Duke et al. (2009) did. Negative firms experienced a decrease in net income and an increase in assets due to operational lease capitalization and as a consequence

the nominator for calculating the ROA decreases and the denominator increases. This explains the negative effect of operational lease capitalization on ROA, which have been found in previous studies (Bennet and Bradbury, (2003); Duke et al., (2009); Fülbier et al., (2008)). On the contrary, positive firms experienced an increase in net income (nominator) and an increase in assets (denominator) due to operational lease capitalization, which could explain the ambiguous effect. Furthermore, the effect of on-balance sheet reporting of operating leases on the return on equity (ROE) has been investigated. Also for this ratio, the effect is ambiguous. Durocher (2008) found a decrease of 0.73% in absolute terms, but this effect was only significant at a 10% level. But Fülbier et al (2008) found a significant increase of 2.8%. In short, the literature did not provide a clear impact of IFRS 16 on the profitability ratios. As a consequence, the next hypotheses will be stated in their null form:

Hypothesis 5: IFRS 16 do not affect the profitability ratios of the companies.
Hypothesis 6: There is no difference in the IFRS 16 effect on the profitability ratios between lease intensive companies and the less lease intensive companies.

Furthermore, measures as EBITDA and EBIT will be investigated. Arnold and Tahtah (2017) found that the EBITDA increased by 12,5% after operational lease capitalization. This is probably because there will be more depreciation costs over the leased assets with the recognition of the operational leased assets. In addition, the EBIT increased by 9.6%. This is because under the new leasing rules a part of the lease payment, the interest costs, will be recognized as financing costs instead of classifying the whole lease payment as operational costs under IAS 17 (Arnold & Tahtah, 2017). Also for these measures, it can be expected that the impact of IFRS 16 will be bigger for lease intensive companies. For example, Singh (2012) observed that the EBITDA increased by 61.3% due to operational lease capitalization for only the retail sector. Based on this context, the following hypothesis will be tested:

Hypothesis 7: IFRS 16 will increase the profit of the companies measured as EBITDA and EBIT.
Hypothesis 8: The impact of IFRS 16 on the companies' EBITDA and EBIT will increase more for lease intensive companies in comparison with the less lease intensive companies.

2.3 Substitution effect
Previous studies showed that operational lease capitalization had an impact on the financial metrics of the company, in particular the liquidity and solvability of the company. However, Díaz and Ramírez (2018b) argue that managers are trying to mitigate the proposed impact of IFRS 16. Before the existence of IFRS 16, managers had an incentive to convert the financial

leases into operational leases because of the accounting advantages at that time for operational leases (Díaz & Ramírez, 2018a). However, with IFRS 16 there is no difference in accounting treatment for financial and operational leases. Still, researchers are advising or expecting managers to minimalize the effect of operational lease capitalization on the financial metrics (Goodacre, 2003; Díaz & Ramírez, 2018b). One way of substitution can take place is to engage more in lease contracts with a duration of less than a year or a value less than 5000 dollars, because these kinds of leases will not be capitalized on the balance sheet. Another way to mitigate the proposed effects of operational lease capitalization could be that managers are making decisions to change the capital structure of the company. For example, Abdel-Khalik (1981) suggested in his study that managers will make decisions to mitigate the leverage increasing effect of lease capitalization by increasing equity and decreasing conventional debt. A more comprehensive study that observed the capital structure changes is the research of Imhoff and Thomas (1988). They investigated how managers responded to the new Statement of Financial Accounting Standard (SFAS) 13, where for the first time financial leases had to be activated on the balance sheet and operational leases could still be disclosed in the footnotes. They observed a substitution from financial leases to operating leases, a significant decrease in total leasing, a significant decrease in debt and an insignificant increase in equity. So Imhoff and Thomas (1988) concluded that managers made decisions to offset the leverage increasing effect of SFAS 13. Based on this finding, it can be expected that managers will respond in a similar way to the adoption of IFRS 16 because previous research showed that through operational lease capitalization the liquidity and solvability have deteriorated. To mitigate this proposed effect, it can be expected that managers will make decisions to decrease their debt and leasing level and to raise their equity level because this will offset the recognition of new liabilities arising from IFRS 16. Furthermore, Imhoff and Thomas (1988) observed that the magnitude of the capital structure changes was significantly larger for high lease firms. Probably because high lease firms are more affected by the new standard than low lease firms. As a result, the following hypotheses will be tested:

Hypothesis 9: The level of leasing will decrease in the first year of the post-adoption period.
Hypothesis 10: The level of leasing will decrease more for lease intensive firms than for less lease intensive firms in the first year of the post-adoption period.
Hypothesis 11: The level of debt will decrease in the first year of the post-adoption period.
Hypothesis 12: The level of debt will decrease more for the lease intensive firms than for the less lease intensive firms in the first year of the post-adoption period.
Hypothesis 13 The level of equity will increase in the first year of the post-adoption period.
Hypothesis 14: The level of equity will increase more for the lease intensive firms than for the less lease intensive firms in the first year of the post-adoption period.

3. Data and Methodology

3.1 Data

In this research data will be collected from public listed companies from the Netherlands (AEX, AMX and AScX), Belgium (BEL-20), Germany (DAX-30) and France (CAC-40). Data will be hand collected by looking at the annual reports of 2018 and 2019. This is because the study need specific variables that were not available in the databases of Compustat or Orbis. In addition, the databases do not describe if a particular company has used the full or modified retrospective approach. This makes it hard to identify which accounting numbers are adjusted for IFRS 16 or not and to fully attribute the effect to IFRS 16.

The total sample included 165 companies beforehand. However, financial companies will not be included in the sample, because of their specific laws and regulation. In addition, some companies did not report enough information to be included in this research. Furthermore, five companies were double indexed at the indexes used in this study. Also, seven companies reported their amounts in dollars, but this has been adjusted by using an exchange rate of 1 dollar:0.84 euro (AB INBEV, 2019, p.91). In the end, this leads to a sample size of 136 observations (Table 1, Appendix A).

Tables 2, 3 and 4 (all the tables can be found in Appendix A) present the descriptive statistics for the variables used in this study. All the variables are presented in millions, except for the ratios. From Table 2 it seems that the data distribution is skewed for EBITDA, EBIT and all the financial ratios, except for the ROA and ROE, because the median and mean values are not nearly equal. Table 4 shows that the average lease intensity, which has been calculated as the RUA begin 2019 divided by the total assets begin 2019, equals 5.2%. It seems that the sample used in this study is not quite lease intensive. Table 3 presents the descriptive statistics of the variables used for the capital structure changes. It can be seen from this table that the mean of the unexpected lease change, change in debt and change in equity is positive.

3.2 Methodology

3.2.1 Impact on the financial metrics

Data will be retrieved from the annual reports of 2018 and 2019. Some of the companies used the full retrospective method. So companies have restated the accounts of 2018 according to IFRS 16. The end balancing accounts of 2018 (control group), which can be found in the annual reports of 2018, will be compared with the restated accounts of 2018 (treatment group), which can be found in the 2019 annual reports. But several companies also used the modified retrospective method. In this approach, the end balances of 2018 have not been restated according to IFRS 16. For these companies, the end balances of 2018 will be adjusted with the information given in the notes to get a treatment group. Based on these balances, the financial metrics will be calculated before and after the introduction of IFRS 16. For liquidity,

the current ratio and the cash ratio will be used. The solvability will be operationalized as the D/A ratio and the D/E ratio. Lastly, the profitability will be operationalized by using the ROA and ROE. The computation of these financial metrics can be found in Table 5. The profitability will also be measured as EBITDA and EBIT. Dependent on the distribution of the data, a paired t-test or a Wilcoxon matched-pairs signed-rank test will be performed to capture the impact of IFRS 16 on the liquidity, solvability and profitability for the first eight hypotheses.

To determine if the data is normally distributed, the outliers should be identified first. This will be done by using the Turkey's fence method. All observations that lies one and a half times the interquartile range beyond the first and third quartile will be removed. After removing the outliers histogram plots will be made. From these plots (all the figures can be found in Appendix B), it can be established that for all financial metrics the data is rather skewed than normal distributed (Figure 1-7). Only for the EBIT, there seems to be a normal pattern (Figure 8). However, based on Table 6, which performs a Shapiro Wilk test, it can be concluded that all financial metrics are not normally distributed. This test states as a null hypothesis that the data is normally distributed, however for all financial metrics the p-value is smaller than the applied significance level of 5%. So it can be assumed that the data distribution of the financial metrics is not normal. As a consequence, a Wilcoxon matched-pairs signed-rank test will be performed.

Furthermore, in this study, the effect of IFRS 16 for high leasing firms and low leasing firms will be analysed for each of the hypotheses to determine if the effect is more pronounced for high leasing firms than for low leasing firms. Based on the lease intensity, the sample will be split equally into 68 high leasing firms and 68 low leasing firms. For hypotheses 2, 4, 6 and 8 an assumption will be made that the data is normally distributed to make comparisons between the lease intensive and the less lease intensive companies. So a paired t-test will be performed for the high lease sample and low lease sample to determine if the IFRS 16 effect on the liquidity, solvability and profitability is more pronounced for high leasing firms.

3.2.2 Capital structure changes

To capture if there are any capital structure changes, the model of Imhoff and Thomas (1988) will be used as a starting point:

$$Unexpected\ change\ in\ leases = \beta 0 + \beta 1 * right\ to\ use\ assets\ begin\ 2019 + \epsilon \qquad (1)$$

The unexpected change in leases equals the difference between the right to use assets end 2019 and the expected right to use assets end 2019. The expected value of the right to use assets end 2019 is the difference between the beginning value of the right to use assets in 2019 and the depreciation and impairment of the leased assets in 2019. The computation of these variables and the next upcoming variables can be found in Table 7. So if the dependent variable of model 1, the unexpected change in leases, is positive it means the company has

leased more and if the unexpected change in leases is negative it means the company has leased less. So if $\beta1$ in equitation 1 is significantly different from zero and negative, hypothesis 9 will be accepted. However, model 1 will be improved by adding some control variables to limit omitted correlated variable bias. The improved model will look as follows:

Unexpected change in leases = β0 + β1* right to use assets begin 2019 + β2 * current ratio + β3 * D/A ratio + β4 * total debt + β5 * cash + ε   (2)

The liquidity and solvability of the company, measured as the current ratio and the D/A ratio, might influence the leasing level. If the current ratio is relatively low and the D/A ratio relatively high then managers could decide to engage in fewer leasing contracts to prevent more deteriorated ratios, because previous literature concluded that operational lease capitalization had a negative impact on the liquidity and solvability of companies. On the contrary, if a company has a sufficient liquidity and solvability level it could be expected that managers still participate in lease contracts or maybe less to maintain the ratio levels. Also, the control variable total debt might influence the leasing level. If total debt increases for a company, managers might decide to have fewer leasing contracts because IFRS 16 recognizes a new liability on the balance sheet. Lastly, the variable cash has been included in the model, because the amount of cash could determine to buy or lease an asset.

Before the ordinary least squares (OLS) regression will be performed, first several assumptions have to be tested. One of the assumptions that should be met is that there should be a linear relationship between the RUA begin 2019 and the unexpected lease change. From Figure 9 it can be concluded this assumption is not violated. There seems a positive linear relation between the RUA and the unexpected lease change. However, the assumption of homoscedasticity has been violated. Figure 10 shows that the residuals are not evenly spread out on the x-axis. In addition, the Breush-Pagan test, which states as null hypothesis that the error variances are all equal, shows that the p-value (0.000) is smaller than the applied significance level of 5% (Table 8), so this null hypothesis will be rejected. As a result, robust standard errors will be used to draw conclusions from model 2. The last assumption that should be tested is the assumption of no (perfect) multicollinearity. From Table 9 it can be concluded that the independent variables from model 2 and the upcoming models are not perfect correlated with each other.

The change in debt and equity will be observed as possibilities for capital structure changes. The following equitation of Imhoff and Thomas (1988) will be used as a starting point to analyse the change in debt:

$Change\ in\ debt = \ \beta0 + \ \beta1 * right\ to\ use\ assets\ begin\ 2019 + \ \varepsilon$ (3)

The change in debt is the difference between the debt issues and the debt retirements for the year 2019 (Table 7). If the change in debt is positive, it means that the debt issues are higher than the repayments of debt. If the change in debt is negative it means that the repayments of

debt are higher than the debt issues. So if $\beta 1$ in equitation 3 is significantly different from zero and negative, hypothesis 11 will be accepted. Model 3 will be improved by adding some control variables:

Change in debt = β0 + β1* right to use assets begin 2019 + β2 * current ratio + β3 * D/A ratio

+ β4 * total debt + β5 * cash + β6 * EBIT+ ϵ (4)

The current ratio and D/A ratio will probably influence the change in debt because these ratios indicate if a company is liquid and solvable enough. For example, if the current ratio is too low or the D/A ratio is too high, then the manager might have an incentive to improve these ratios by changing the debt level. The model has also been controlled for the level of total debt, because if a company has a high or low debt level, then the company could have more incentives to reduce or increase the level of debt. Furthermore, the control variable cash has been included in the model, because the more cash a firm has, the more resources the firm has to redeem debt. Lastly, the profitability measured as EBIT has been included in the model. Because if a firm is profitable, then it can attract more debt or it has more resources to redeem debt.

Also for model 4, there should be a linear relationship between the RUA and change in debt. From Figure 11 it can be concluded this assumption is not violated. There seems a negative linear relationship between the RUA and the change in debt. For the assumption of homoscedasticity, Figure 12 will be used. This plot shows that the residuals are not evenly spread out on the x-axis but most of the error terms are close to the zero line, except for some outliers. The Breusch-Pagan test for model 4 gives a p-value (0.264) bigger than the significance level of 5% (Table 8). So the assumption can be made that model 4 has met the assumption of homoscedasticity.

For the change in equity, the following model will be used that have been formulated by Imhoff and Thomas (1988):

$Change\ in\ equity = \ \beta0 + \ \beta1 * right\ to\ use\ assets\ begin\ 2019 + \ \varepsilon$ (5)

The change in equity is the difference between the book value of equity end 2019 and the book value of equity begin 2019 (Table 7). If $\beta 1$ in equitation 5 is significantly different from zero and positive, hypothesis 13 will be accepted. Again model 5 will be improved by adding some control variables. The equitation will look as follows:

Change in equity = β0 + β1* right to use assets begin 2019 + β2 * current ratio + β3 * D/A ratio

+ β4 * total debt + β5 * cash + β6 * EBIT + ϵ (6)

The control variables current ratio and D/A ratio could influence the change in equity. For instance, if a company is liquid and solvable enough it could attract more equity. Furthermore, the control variable total debt has been included. Total debt could have a relation with the change in equity because if a firm has a lot of debt, it could be that the manager has more incentives to fund their assets with equity than debt. Also, the control variable cash has been

included. For example, if a company has a lot of cash, it could be that the manager has fewer incentives to obtain extra funding. Lastly, the profitability measured as EBIT has been included as a control variable. This is because the bigger the profit the more could be retained in reserves.

Figure 13 shows almost a horizontal line between the RUA and the change in equity. So for model 6, the assumption will be made there is a linear relation between RUA and change in equity. The assumption of homoscedasticity has been met because from Figure 14 it can be established that the observations are mostly spread out around the x-axis and the zero line. In addition, the Breusch-Pagan test for model 6 gives a p-value (0.585) bigger than the significance level of 5% (Table 8).

Furthermore, in this study, the capital structure changes for high leasing firms and low leasing firms will be analysed to determine if the capital structure changes are more pronounced for high leasing firms than for low leasing firms. Based on the lease intensity, the sample will be split equally into 68 high leasing firms and 68 low leasing firms. Equitations 2, 4 and 6 will be performed for both samples to compare the $\beta 1$ coefficients and to determine if the capital structure changes are more pronounced for high leasing firms. The assumptions made for the regressions of the whole sample will be applied for the regressions of the split sample.

3.3. Power

Because of the limited amount of observations of 136, a power calculation will be performed to determine how big the effect size should be between the treatment (the financial metrics after IFRS 16) and the control group (the financial metrics before IFRS 16) to obtain a power of 80%. From Table 10 it can be concluded that the minimum effect size for the current ratio and the cash ratio should be at least 0.02 and 0.008 to get a power of 80%. These amounts should be reasonable to obtain. Other studies showed a much bigger difference with fewer observations (Bennet & Bradbury, 2003; Durocher, 2008). Furthermore, from Table 2 it can be seen that the mean of the differences for these liquidity ratios (-0.052 and -0.017) are bigger than the minimum effect size. For the D/A ratio, a minimum effect size of 0.007 should be obtained (Table 10). Previous research showed an increase of 2.7%, also with fewer observations (Durocher, 2008). In addition, Table 2 shows that the mean of the D/A difference equals 0.02, which is bigger than the minimum effect size. The minimum effect size for the D/E ratio should be 0.106 (Table 10). Other research found a much bigger increase (Duke et al, 2009) and also from Table 2 it can be seen that the mean of the D/E difference (0.213) is bigger than the minimum effect size. Also for the ROA and EBITDA, the mean of the differences (-0.001 and 520, Table 2) are equal or bigger than the minimum effect size (0.001 and 254, Table 10). But for the ROE and EBIT, the mean of the differences (0.0003 and 24,

Table 2) is smaller than the minimum effect size (0.004 and 32, Table 10). In short, it can be concluded that 136 observations could be enough to obtain a power of at least 80% except for the ROE and EBIT.

  To draw careful conclusions again a power calculation will be made afterwards in combination with the acceptation or rejection of a significant effect. This will be done through the Monte Carlo simulation. The Monte Carlo simulation is a sufficient tool to calculate the power if the data is not normally distributed, which is the case for all financial metrics in this study. The Monte Carlo simulation generates 1000 non-normal datasets randomly, with the following inputs of the difference scores: the mean, standard deviation, skewness and kurtosis. Then it calculates the mean, the variance and the corresponding statistic of each data set to reject or accept the null hypothesis. Each rejection of the null hypothesis will be stored and the power will equal the number of rejections divided by the number of simulations, which is 1000 (Du et al., 2017).

4. Results

4.1 Impact on the financial metrics

4.1.1 Impact on the liquidity

The first hypothesis that will be tested in this study is if *IFRS 16 will decrease the liquidity of the companies*. After performing a Wilcoxon matched-pairs signed-rank test, it can be concluded from Table 11 that the current ratio as the cash ratio significantly decreased after IFRS 16 (both p-values < alpha = 0.05). The median of the current ratio decreased from 1.19 to 1.14, whereas the median of the cash ratio slightly decreased from 0.234 to 0.227 after the implementation of IFRS 16 (Table 2). It should be noted that the decrease in the median for the cash ratio is not that big, so the economic significance is insufficient. As described in section 3.3 a power calculation will be executed through the Monte Carlo simulation to validate if this study has enough power. For the current ratio a power of 100% and for the cash ratio a power of 99.4% has been obtained (Table 12). In conclusion, IFRS 16 will reduce the current ratio as the cash ratio. But the significant decrease in the cash ratio lacks economic significance. However, overall it can be concluded that the liquidity of companies will decrease through IFRS 16. As a result, hypothesis 1 will be accepted.

The second hypothesis will test if *the liquidity of the companies which have a high lease intensity will decrease more than the companies which are less lease intensive.* From Table 13 Panel A it can be seen that for the lease intensive companies the mean of the current ratio will decrease significantly with 0.07 after IFRS 16, whereas from Table 13 Panel B it can be established that for the less lease intensive companies the mean of the current ratio will decrease significantly with 0.04. Also, the cash ratio will decrease significantly for both groups after IFRS 16. The lease intensive companies show a drop of 0.02, whereas the less lease intensive companies show a reduction of 0.01. So it can be concluded that the lease intensive companies show a bigger reduction in their current ratio and cash ratio level after the implementation of IFRS 16 in comparison with the less lease intensive companies. As a consequence, hypothesis 2 will be accepted.

4.1.2 Impact on the solvability

IFRS 16 will decrease the solvability of the companies is the third hypothesis that will be tested. From Table 11 it can be established that the D/A ratio as the D/E ratio increases significantly (both p-values < alpha = 0.05). The median of the D/A ratio before IFRS 16 was 0.57 and after IFRS 16 0.60 (Table 2). Also, the median of the D/E ratio increased from 1.29 to 1.51 after IFRS 16 (Table 2). Furthermore, the power for both financial ratios equals 100% (Table 12). In short, it can be concluded that IFRS 16 leads to a more worsened solvability of companies. So hypothesis 3 will be accepted.

Then will be tested if *the solvability of the companies which have a high lease intensity will decrease more than the companies which are less lease intensive,* which is the fourth hypothesis of this study. From Table 13 Panel A, it can be concluded that the mean of the D/A ratio increases significantly with 0.04 after IFRS 16 for the lease intensive companies, whereas for the less lease intensive companies it increases by 0.01 (Table 13 Panel B). It can also be established from Table 13 that the D/E ratio for the lease intensive companies shows a bigger significant increase of the mean in comparison with the less lease intensive companies (0.38 respectively 0.05). In conclusion, the D/A ratio as the D/E ratio increases more and so worsen the solvability more for the lease intensive companies than for the less lease intensive companies. So hypothesis 4 will be accepted.

4.1.3 Impact on the profitability

The fifth hypothesis that will be tested is that *IFRS 16 do not affect the profitability ratios of the companies.* From Table 11 it can be concluded that the median of the ROA before IFRS 16 is different from the ROA after IFRS 16 because the p-value (0.000) is smaller than alpha (0.05). However, the median of the ROA before IFRS 16 is 0.071 and the median after IFRS 16 is 0.070 (Table 2). There is not much of a difference and so the economic significance is low. Despite there being a statistically significant decreasing effect for the ROA, it can be concluded that IFRS 16 do not affect the ROA. Table 11 also shows that there is not enough evidence to say there is a median difference between the ROE before and after IFRS 16 because the p-value of 0.156 is bigger than the significance level of 5%. It can be established that IFRS 16 do not affect the profitability ratios. As a result, hypothesis 5 will not be rejected. However, the power is also something to consider. Section 3.3 concluded that the ROE might have not enough power. The Monte Carlo power calculation supports this. From Table 12 it can be seen that the power for the ROE equals 5.4%, but also the power for the ROA is insufficient (40.2%). So this study design for the ROA as for the ROE has a lot of chance to commit a Type II error, which should be considered in the conclusion and discussion section.

The next hypothesis that will be tested is: *There is no difference in the IFRS 16 effect on the profitability ratios between lease intensive companies and the less lease intensive companies.* From Table 13 Panel A it can be concluded that for the lease intensive companies there is no difference between the ROA before and after IFRS 16. However, for the less lease intensive companies, there is a statistical difference between the ROA before IFRS 16 and after IFRS 16 because the p-value is smaller than the alpha of 5% (Table 13 Panel B). But the effect equals -0.0003 which is very low, so the economic significance is insufficient. In short, there is no difference in the impact of IFRS 16 on the ROA between the two groups. This can also be established for the ROE. For the lease intensive companies as for the less lease

intensive companies it can be seen from Table 13 there is no statistical difference between the mean of the ROE before IFRS 16 and after IFRS 16. So hypothesis 6 will not be rejected.

Other profitability measures that will be investigated are EBIT and EBITDA. Hypothesis 7 states that *IFRS 16 will increase the profit of the companies measured as EBITDA and EBIT.* From Table 11 it can be concluded that the median of the EBITDA after IFRS 16 is significantly larger than the EBITDA before IFRS 16 because the p-value (0.000) is smaller than alpha (5%). The median of the EBITDA before IFRS 16 was 1268 million euros and after IFRS 16 it was 1419 million euros (Table 2). This study has also enough power for the EBITDA. It can be seen from Table 12 that the power equals 100%. Furthermore, it can be established from Table 11 that the median of EBIT after IFRS 16 is significantly larger than the median before IFRS 16 (p-value of 0.004 is smaller than alpha of 5%). The median of EBIT before IFRS 16 was 2098 million euros and after IFRS 16 it was 2123 million euros (Table 2). Section 3.3 concluded that the EBIT might have not enough power. However, Table 12 shows that the power for EBIT is close to the 80% range (75.3%). Because of the fact the power does not deviate that much from the applied power range, it can be concluded that the EBIT but also EBITDA increase after the implementation of IFRS 16. Hence hypothesis 7 will be accepted.

The last hypothesis that will be tested for the impact on the financial metrics is if t*he impact of IFRS 16 on the companies' EBITDA and EBIT will increase more for lease intensive companies in comparison with the less lease intensive companies.* Table 13 Panel A shows that for the lease intensive companies the mean of EBITDA increases significantly with 764 million euros after IFRS 16, whereas Table 13 Panel B demonstrates that for the less lease intensive companies the mean of EBITDA increases significantly with 277 million euros, which is less pronounced. Also, the effect of IFRS 16 on EBIT is more pronounced for lease intensive companies. Table 13 Panel A shows that for the lease intensive companies the mean of EBIT will increase significantly with 45 million euros, whereas Table 13 Panel B shows that for the less lease intensive companies there is no significant difference between the EBIT before and after IFRS 16. In short, it can be concluded that the impact of IFRS 16 on the companies' EBITDA and EBIT will increase more for lease intensive companies in comparison with less lease intensive companies. So hypothesis 8 will be accepted.

4.2 Capital structure changes

4.2.1 Impact on the leasing level

It is clear from previous literature and from section 4.1 that IFRS 16 impacts some financial metrics. As a result, managers could respond to that, for example changing their amount of leasing contracts or capital structure. Hypothesis 9 will test if *the level of leasing will decrease in the first year of the post-adoption period.* To determine this, an ordinary least square regression with robust standard errors will be used. Table 14 presents that if the RUA begin

2019 increases with 1 million, ceteris paribus, the unexpected lease change will increase by 211,000 euros. Furthermore, the RUA has a positive significant effect on the unexpected lease change, because the p-value (0.000) is smaller than alpha (5%). So the beginning value of the RUA will not result in a reduction in the amount of leasing instead, it will increase the amount of leasing. In short, managers are still participating in new lease contracts. This result contradicts the formulated hypothesis and so hypothesis 9 will not be accepted.

The tenth hypothesis of this study is: *The level of leasing will decrease more for lease intensive firms than for less lease intensive firms in the first year of the post-adoption period.* Table 15 Panel A shows a positive significant effect of the RUA on the unexpected lease change (p-value = 0.000 < alpha = 0.05) for the lease intensive companies. Ceteris paribus, an increase of 1 million euros in the RUA will result in an increase of 253,000 euros. For the less lease intensive companies, an increase of 1 million euros in RUA leads to an increase of 117,000 million euros in the unexpected lease change ceteris paribus (Table 15 Panel B). However, the increase of the unexpected lease change due to the beginning amount of the RUA is only significant on a 10% level for the less lease intensive companies. So it can be concluded that the lease intensive companies show a bigger increase in the unexpected lease change in comparison with the less lease intensive companies, which showed no significant effect of the RUA on the unexpected lease change on a 5% level. In conclusion, the above findings contradict the formulation of hypothesis 10. As a result, hypothesis 10 will not be accepted because in this hypothesis a decrease in the unexpected lease change was expected.

4.2.2 Impact on the debt level

Another possible response a manager could do is to change the debt level. Hypothesis 11 will test if *the level of debt will decrease in the first year of the post-adoption period.* Table 16 shows a negative significant effect of the RUA on the change in debt because the p-value of 0.048 is smaller than the alpha of 5%. An increase of 1 million euros in the RUA will decrease the change in debt with 144,000 euros ceteris paribus. So managers retire more debt than attracting debt in the first year of the post-adoption period. As a result, hypothesis 11 will be accepted.

Hypothesis 12 will test if *the level of debt will decrease more for the lease intensive firms than for the less lease intensive firms in the first year of the post-adoption period.* Table 17 Panel A shows a negative significant effect of the RUA on the change on debt for the lease intensive firms (p-value = 0.016 < alpha = 0.05). An increase of 1 million euros in the RUA will result, ceteris paribus, in a decrease of 185,000 euros in the change in debt for the lease intensive firms. However, Table 17 Panel B shows a positive significant effect of the RUA on the change in debt (p-value = 0.045 < alpha = 0.05) for the less lease intensive firms. An

increase of 1 million euros in the RUA will result in an increase of 1,291,000 euros of the change in debt ceteris paribus. So the less lease intensive firms are issuing more debt than retiring debt. From the above-described findings, it can be established that the lease intensive firms show a bigger decrease in the change in debt than the less lease intensive firms, which showed an increase in the change in debt. As a consequence, hypothesis 12 will be accepted.

4.2.3 Impact on the equity level

The last capital structure change that will be investigated in this study is the change in equity. Hypothesis 13 will test if *the level of equity will increase in the first year of the post-adoption period.* To test this hypothesis an OLS regression will be used, with the assumption made that there is a linear relationship between the change in equity and the RUA begin 2019 (see section 3.2.2). From Table 18 it is clear that there is no significant effect of the RUA begin 2019 on the change in equity because the p-value of 0.355 is bigger than the significance level of 5%. In addition, the coefficient of the RUA begin 2019 is negative instead of the predicted positive sign. So hypothesis 13 will be rejected.

The last hypothesis that will be tested is hypothesis 14: *The level of equity will increase more for the lease intensive firms than for the less lease intensive firms in the first year of the post-adoption period.* Table 19 Panel A shows for the lease intensive firms a positive coefficient for the RUA begin 2019, which was predicted. However, the p-value (0.927) is bigger than the significance level (5%), so there is no significant effect of the RUA begin 2019 on the change in equity for the lease intensive firms. Table 19 Panel B shows the results for the less lease intensive companies. It can be seen from this table that an increase of 1 million euros in the RUA begin 2019 will lead to a decrease of 1,694,000 euros in the change in equity. Furthermore, the p-value (0.008) is smaller than the significance level (5%) so there is a negative significant effect of the RUA on the change in equity for the less lease intensive firms. However, the lease intensive firms showed no significant effect, so hypothesis 14 will be rejected.

5. Conclusion and discussion

5.1 Conclusion to the research question

Before a conclusion is drawn to the research question, first the findings will be discussed. This study found that the current ratio as the cash ratio significantly decreased after the implementation of IFRS 16. But the economic significance of the cash ratio was insufficient. Another finding was that the lease intensive firms showed a bigger decrease in these liquidity ratios in comparison with the less lease intensive firms. For the D/A ratio as the D/E ratio, a significant increase have been found after the new standard. In addition, this effect is more pronounced for lease intensive firms. The introduction of the new leasing standard showed a significant decrease in the ROA, but also here the economic significance was low. Furthermore, no significant effect has been found on the ROE. So it seems that IFRS 16 do not affect the profitability ratios. In addition, there was no difference observed between the lease intensive companies and the less lease intensive companies of the effect of IFRS 16 on these profitability ratios. However, the EBITDA and EBIT increased significantly after the new standard. This increase was more pronounced for the lease intensive firms than for the less lease intensive firms. A different aspect that has been investigated in this research is the substitution effect. This study found a significant positive effect of the RUA on the unexpected lease change. This effect was more pronounced for the lease intensive firms. Another finding was that the RUA had a significant negative effect on the change in debt and the decrease in the change in debt was more pronounced for the lease intensive firms than for the less lease intensive firms, which showed a positive significant effect. Lastly, the change in equity has been observed. This study found no significant effect of the RUA on the change in equity. It also observed that the effect of the RUA on the change in equity for the lease intensive firms is not bigger in comparison with the less lease intensive firms.

Based on these findings, an answer can be given to the following research question: *What is the impact of IFRS 16 Leases on the liquidity, solvability and profitability and if there is any impact do managers change the capital structure of the company?*

IFRS 16 will worsen the liquidity and solvability of companies. This effect is more pronounced for lease intensive firms. However, IFRS 16 do not affect the profitability ratios, but the new leasing standard will increase the profitability of firms measured as EBITDA and EBIT. This increase is also more pronounced for the lease intensive firms. Based on the impact of IFRS 16, managers could respond to this. This study concludes that firms are not changing their leasing behaviour. Firms are still participating in lease contracts, but firms will redeem more debt as the level of RUA increases. This effect is more pronounced for lease intensive firms. However, managers are not changing their equity level due to the amount of RUA.

This study found that the liquidity and solvability of companies have deteriorated after the implementation of IFRS 16. So the situation before IFRS 16 and after IFRS 16 is not the same for the companies, looked at the deteriorated ratios. It can be concluded that the financial statement is more a true and fair view of the economic position of the company after IFRS 16, so the goal of the IASB with this new standard has been accomplished. As a result, stakeholders can make better decisions. In addition, companies are still leasing despite the negative effect of IFRS 16 on their liquidity and solvability. It seems that the new leasing standard does not discourage companies to lease. In fact, the new standard encourages companies to retire more debt instead of attracting debt, which is a healthy effect. So the new leasing standard works as intended. Overall, IFRS 16 has a great contribution.

5.2 Limitations and future research

This research has certain limitations. First of all, the data distribution of the financial metrics was not normal. A reason could be the limited amount of observations. As a result, a Wilcoxon matched-pairs signed-rank test had to be performed to determine the effect of IFRS 16 on the financial metrics. However this test doesn't say anything about the average increase or decrease of a financial metric after the new standard, so it was difficult to compare the results with other studies in sense of the effect size. Another limitation is that for the splitted sample (lease intensive companies versus the less lease intensive companies) an assumption of normal data had been made to compare the effect size on the financial metric between the two groups. So the results obtained for the hypotheses of the splitted sample could be biased and should be used carefully. The low power level obtained for the ROA as for the ROE is also a limitation because this increases the chance of making a Type II error. So the conclusion made in this study that IFRS 16 do not affect the profitability ratios should be used carefully and might be wrong. Future research might have to come with a better study design for these ratios to investigate the effect of IFRS 16. Also, a limitation is the linear assumption made for the change in equity and the beginning value of the RUA 2019. This could explain the none significant effects found on the change in equity. Maybe another model was more appropriate for the change in equity, so future research could investigate other models for the change in equity. Another suggestion is to look at other variables for the capital structure changes, for example, the substitution to short term leases and low-value leases. Also, the computation of the variables could be different, for instance, the change in debt could be the difference between the beginning and end book value of the debt or the change in equity could be the number of share issues. A different recommendation for future research is looking at time series regression for the capital structure changes. This study had focused only on one year after the post-adoption period, but the years thereafter or the years before the initial application could also be analysed.

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Appendix A

Table 1

Sample description

Total companies	165
Financial companies	(16)
Insufficient information	(8)
Double indexed	(5)
Total sample size	**136**

Table 2

Descriptive statistics for the financial metrics

Variable	Obs.	Mean	Median	Standard deviation	Min.	Max.
Current ratio before	136	1.523	1.191	1.513	0.085	14.291
Current ratio after	136	1.470	1.143	1.467	0.084	13.917
Current ratio difference	136	-0.052	-0.029	0.071	-0.492	0.003
Cash ratio before	136	0.483	0.234	0.932	0.004	7.016
Cash ratio after	136	0.466	0.227	0.902	0.004	6.832
Cash ratio difference	136	-0.017	-0.006	0.036	-0.215	0.001
D/A before	136	0.576	0.565	0.189	0.069	1.287
D/A after	136	0.598	0.604	0.185	0.074	1.279
D/A difference	136	0.021	0.012	0.030	-0.008	0.202
D/E before	136	2.226	1.286	4.093	-4.479	33.653
D/E after	136	2.440	1.513	4.328	-4.579	36.347
D/E difference	136	0.213	0.075	0.493	-0.100	3.948
ROA before	136	0.062	0.071	0.118	-1.040	0.333
ROA after	136	0.061	0.070	0.117	-1.031	0.329
ROA difference	136	-0.001	-0.0004	0.006	-0.038	0.028
ROE before	136	0.124	0.127	0.231	-1.524	0.767
ROE after	136	0.125	0.126	0.226	-1.524	0.767
ROE difference	136	0.0003	0.000	0.018	-0.055	0.191
EBITDA before	136	3425	1268	6485	-254	53324
EBITDA after	136	3945	1419	7441	-183	61868
EBITDA difference	136	520	135	1185	-276	8544
EBIT before	136	2098	699	3879	-940	31550
EBIT after	136	2123	708	3898	-770	31714
EBIT difference	136	24	1	149	-581	1188

Note. The financial metric difference is the difference between the financial metric after IFRS 16 – financial metric before IFRS 16. The financial metrics EBITDA and EBIT are presented in millions of euros and rounded as a whole.

Table 3

Descriptive statistics for the capital structure changes

Variable	Obs.	Mean	Median	Standard deviation	Min.	Max.
RUA begin 2019	136	1352	290	3039	0.194	25206
Cash level begin 2019	136	2476	821	4589	0.245	28938
Total liabilities begin 2019	136	24789	6328	48151	3	345914
Unexpected lease change	136	334	95	717	-108	5408
Change in debt	136	131	-3	1659	-7097	9404
Change in equity	136	832	173	4784	-12075	50891

Table 4

Descriptive statistics of the other variables to compute the main variables

Variable	Obs.	Mean	Median	Standard deviation	Min.	Max.
RUA end 2019	136	1411	347	3123	0.403	24960
Depreciation and impairment RUA	136	274	72	571	0.059	4190
Expected RUA	136	1077	207	2478	0.135	21016
Debt issues 2019	136	3473	396	14343	0	150822
Debt retirements 2019	136	3341	591	13599	0	143500
Equity begin 2019	136	12972	4516	24456	-1627	202538
Equity end 2019	136	13804	4897	24571	-1487	190463
Lease intensity	136	0.052	0.029	0.064	0.0002	0.477
Current assets before	136	13109	3330	26948	4	183536
Current assets after	136	13111	3329	26952	4	183536
Current liabilities before	136	11666	2344	24425	1	167968
Current liabilities after	136	11887	2422	24609	1	168925
Cash level before	136	2476	821	4589	0.245	28938
Total assets before	136	36565	10695	68091	4	458156
Total assets after	136	37760	11453	69498	4	463256
Total liabilities before	136	23574	5947	46915	3	340814
Total equity before	136	12989	4538	24456	-1627	202534
Total equity after	136	12972	4516	24456	-1627	202538
Average total assets before	136	35341	10116	66269	7	440175
Average total assets after	136	35939	10180	66973	8	442725
Net income before	136	1586	585	2850	-710	23352
Net income after	136	1582	569	2847	-497	23356
Average total equity before	136	12609	4369	23985	-1360	200173
Average total equity after	136	12600	4358	23984	-1360	200175

Note. All the variables are presented in millions of euros and rounded as a whole, except for the lease intensity.

Table 5

Computation of the financial ratios

Category	Ratio	Formula
Liquidity	Current ratio	current assets / current liabilities
Liquidity	Cash ratio	cash and cash equivalents / current liabilities
Solvability	Debt to asset ratio	total debt / total assets
Solvability	Debt to equity ratio	total debt / total equity
Profitability	Return on assets	earnings before interest and taxes / average of total assets
Profitability	Return on equity	net income / average of shareholders' equity

Table 6

Shapiro Wilk test

Variable	Observations (excluding outliers)	P-value
Current ratio difference	120	0.000***
Cash ratio difference	124	0.000***
D/A difference	120	0.000***
D/E difference	122	0.000***
ROA difference	108	0.011**
ROE difference	79	0.000***
EBITDA difference	126	0.000***
EBIT difference	102	0.000***

Note. The financial metric difference is the difference between the financial metric after IFRS 16 – financial metric before IFRS 16. ** $p < 0.05$, *** $p < 0.01$

Table 7

Computation of the variables used for the capital structure changes

Variable	Formula
Unexpected change in leases	right to use assets at 31/12/2019 – expected right to use assets at 31/12/2019
Expected right to use assets at 31/12/2019	right to use assets at 1/1/2019 - depreciation and impairment of the leased assets
Change in debt	debt issues of 2019 – debt retirements of 2019
Change in equity	book value of equity at 31/12/2019 - book value of equity at 1/1/2019

Table 8

Breusch-Pagan test

Model	P-value
2	0.000***
4	0.264
6	0.585

Note. *** $p < 0.01$

Table 9

Correlation matrix for the independent variables from the regression models

Variable	RUA begin 2019	Cash begin 2019	Total liabilities begin 2019	EBIT 2018 after IFRS 16	Current ratio after	D/A after
RUA begin 2019	X	0.59	0.55	0.78	-0.12	0.10
Cash begin 2019	0.59	X	0.87	0.80	-0.08	0.13
Total liabilities begin 2019	0.55	0.87	X	0.77	-0.13	0.25
EBIT 2018 after IFRS 16	0.78	0.80	0.77	X	-0.12	0.08
Current ratio after	-0.12	-0.08	-0.13	-0.12	X	-0.54
D/A after	0.10	0.13	0.25	0.08	-0.54	X

Table 10

The minimum effect size for each of the financial metrics to obtain a power of 80%

Financial metric	Observations	Standard deviation	Minimum effect size
Current ratio	136	0.071	0.015
Cash ratio	136	0.036	0.008
D/A ratio	136	0.030	0.007
D/E ratio	136	0.493	0.106
ROA	136	0.006	0.001
ROE	136	0.018	0.004
EBITDA	136	1185	254
EBIT	136	149	32

Table 11

Wilcoxon matched-pairs signed-rank test

Variable	Obs.	Positive differences	Negative differences	Ties	Z-approximation	P-value
Current ratio difference	136	2	134	0	-10.057	0.000***
Cash ratio difference	136	1	135	0	-10.055	0.000***
D/A difference	136	135	1	0	10.02	0.000***
D/E difference	136	135	1	0	9.940	0.000***
ROA difference	136	51	85	0	-3.584	0.000***
ROE difference	136	26	35	57	-1.420	0.156
EBITDA difference	136	135	1	0	9.929	0.000***
EBIT difference	136	85	51	0	2.886	0.004***

Note. The financial metric difference is the difference between the financial metric after IFRS 16 – financial metric before IFRS 16. ** $p < 0.05$, *** $p < 0.01$

Table 12

Monte Carlo power calculation

Variable	Obs.	Mean	SD	Skewness	Kurtosis	Power
Current ratio difference	136	-0.052	0.071	-3.134	12.939	100%
Cash ratio difference	136	-0.017	0.036	-3.612	14.189	99.4%
D/A ratio difference	136	0.021	0.030	3.261	12.985	100%
D/E ratio difference	136	0.213	0.493	5.264	31.208	100%
ROA difference	136	-0.001	0.006	-0.323	15.084	40.2%
ROE difference	136	0.0003	0.018	9.117	99.865	5.4%
EBITDA difference	136	520	1185	4.624	24.361	100%
EBIT difference	136	24	149	3.942	31.213	75.3%

Note. The financial metric difference is the difference between the financial metric after

IFRS 16 – financial metric before IFRS 16.

Table 13

Results for the lease intensive and not lease intensive companies

Variable	Panel A			Panel B		
	Obs.	Mean	Median	Obs.	Mean	Median
Current ratio before	68	1.289	1.138	68	1.757	1.329
Current ratio after	68	1.219	1.094	68	1.722	1.301
Current ratio difference	68	**-0.069*****	-0.042	68	**-0.036*****	-0.017
Cash ratio before	68	0.427	0.246	68	0.540	0.231
Cash ratio after	68	0.405	0.234	68	0.528	0.227
Cash ratio difference	68	**-0.023*****	-0.008	68	**-0.012*****	-0.003
D/A before	68	0.595	0.581	68	0.558	0.539
D/A after	68	0.631	0.618	68	0.564	0.547
D/A difference	68	**0.037*****	0.023	68	**0.006*****	0.006
D/E before	68	2.250	1.361	68	2.202	1.167
D/E after	68	2.633	1.593	68	2.247	1.208
D/E difference	68	**0.382*****	0.190	68	**0.045*****	0.031
ROA before	68	0.056	0.076	68	0.069	0.069
ROA after	68	0.055	0.078	68	0.068	0.067
ROA difference	68	**-0.002**	-0.001	68	**-0.0003****	-0.0002
ROE before	68	0.093	0.119	68	0.156	0.132
ROE after	68	0.094	0.112	68	0.156	0.131
ROE difference	68	**0.0006**	0.000	68	**-0.00004**	0.000
EBITDA before	68	3219	1121	68	3630	1351
EBITDA after	68	3983	1355	68	3907	1445
EBITDA difference	68	**764*****	195	68	**277*****	89
EBIT before	68	1984	614	68	2213	974
EBIT after	68	2028	616	68	2217	971
EBIT difference	68	**45****	7	68	**4**	1

Note. . Panel A consists of the lease intensive companies and Panel B consists of the less lease intensive companies. The financial metric difference is the difference between the financial metric after IFRS 16 – financial metric before IFRS 16. A paired t-test has been conducted for the before and after variables, in which the main results are bold. The financial metrics EBITDA and EBIT are presented millions of euros and rounded as a whole. ** $p < 0.05$, *** $p < 0.01$.

Table 14

Regression output for model 2 (in millions of euros) – Unexpected lease change

Variable	Coefficient	Robust standard error	T value	P-value
Constant	-37.122	123.934	-0.300	0.765
RUA begin 2019	0.211	0.035	5.976	0.000***
Current ratio after	9.806	14.106	0.695	0.488
D/A ratio after	128.458	203.682	0.631	0.529
Total liabilities begin 2019	0.004	0.002	2.098	0.038**
Cash begin 2019	-0.043	0.027	-1.602	0.112
N	136			
R^2	0.803			

Note. ** $p < 0.05$, *** $p < 0.01$

Table 15

Regression output of model 2 for the lease intensive and less lease intensive companies (in millions of euros) – Unexpected lease change

Variable	Panel A				Panel B			
	Coef.	Robust SE	T	P	Coef.	Robust SE	T	P
Constant	265.060	131.430	2.017	0.048**	273.610	261.420	-1.047	0.299
RUA begin 2019	0.253	0.017	14.761	0.000***	0.117	0.061	1.903	0.062*
Current ratio after	-1.805	34.559	-0.052	0.959	24.379	24.044	1.014	0.315
D/A ratio after	295.020	168.740	-1.748	0.086*	537.300	467.960	1.148	0.256
Total liabilities begin 2019	0.006	0.007	0.930	0.356	0.001	0.001	0.964	0.339
Cash begin 2019	-0.124	0.057	-2.170	0.034**	0.009	0.015	0.588	0.558
N	68				68			
R^2	0.912				0.475			

Note. Panel A consists of the lease intensive companies and Panel B consists of the less lease intensive companies. * $p <0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 16

Regression output for model 4 (in millions of euros) – Change in debt

Variable	Coefficient	Standard error	T value	P-value
Constant	700.900	668.400	1.049	0.296
RUA begin 2019	-0.144	0.072	-1.993	0.048**
Current ratio after	-30.490	111.200	-0.274	0.784
D/A ratio after	-908.100	925.100	-0.982	0.328
Total liabilities begin 2019	0.008	0.006	1.286	0.201
Cash begin 2019	0.119	0.066	1.789	0.076*
EBIT after	-0.132	0.079	-1.668	0.098*
N	136			
R^2	0.141			

Note. * $p < 0.1$, ** $p < 0.05$

Table 17

Regression output of model 4 for the lease intensive and less lease intensive companies (in millions of euros) – Change in debt

Variable	Panel A				Panel B			
	Coef.	SE	T	P	Coef.	SE	T	P
Constant	1452.000	602.100	2.411	0.019**	157.675	1229.630	0.128	0.898
RUA begin 2019	-0.185	0.075	-2.477	0.016**	1.291	0.631	2.046	0.045**
Current ratio after	-219.800	181.200	-1.213	0.230	24.525	163.152	0.150	0.881
D/A ratio after	-1615.000	703.000	-2.298	0.025**	1.243	1854.820	0.001	0.999
Total liabilities begin 2019	-0.005	0.014	-0.335	0.739	0.012	0.010	1.257	0.213
Cash begin 2019	0.128	0.074	1.719	0.091*	-0.061	0.125	-0.488	0.627
EBIT after	-0.017	0.067	-0.255	0.800	-0.443	0.175	-2.529	0.014**
N	68				N	68		
R^2	0.400				R^2	0.156		

Note. Panel A consists of the lease intensive companies and Panel B consists of the less lease intensive companies. * $p < 0.1$, ** $p < 0.05$

Table 18

Regression output for model 6 (in millions of euros) – Change in equity

Variable	Coefficient	Standard error	T value	P-value
Constant	-961.000	2051.000	-0.469	0.640
RUA begin 2019	-0.206	0.221	-0.928	0.355
Current ratio after	85.620	341.100	0.251	0.802
D/A ratio after	2906.000	2839.000	1.023	0.308
Total liabilities begin 2019	0.0001	0.019	0.006	0.995
Cash begin 2019	0.1367	0.203	0.673	0.502
EBIT after	-0.063	0.242	-0.259	0.796
N	136			
R^2	0.027			

Table 19

Regression output of model 6 for the lease intensive and less lease intensive companies (in millions of euros) – Change in equity

	Panel A				Panel B			
Variable	Coef.	SE	T	P	Coef.	SE	T	P
Constant	-1969.000	4552.000	-0.433	0.667	-69.330	1202.000	-0.058	0.954
RUA begin 2019	0.052	0.566	0.093	0.927	-1.694	0.617	-2.747	0.008***
Current ratio after	89.820	1370.000	0.066	0.948	61.940	159.500	0.388	0.699
D/A ratio after	4585.000	5315.000	0.863	0.392	-25.890	1813.000	-0.014	0.989
Total liabilities begin 2019	-0.028	0.103	-0.268	0.789	0.004	0.010	0.443	0.659
Cash begin 2019	1.055	0.561	1.880	0.065*	0.006	0.122	0.049	0.961
EBIT after	-0.852	0.505	-1.687	0.097*	0.737	0.171	4.308	0.000***
N	68				N	68		
R^2	0.093				R^2	0.311		

Note. Panel A consists of the lease intensive companies and Panel B consists of the less lease intensive companies. $* p < 0.01$, $*** p < 0.01$

Appendix B
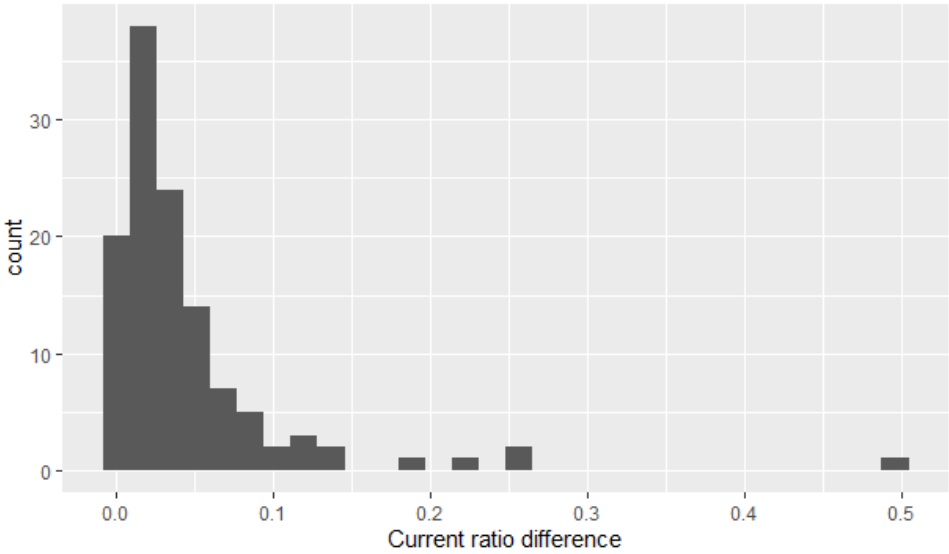
Figure 1. Histogram plot of the current ratio difference
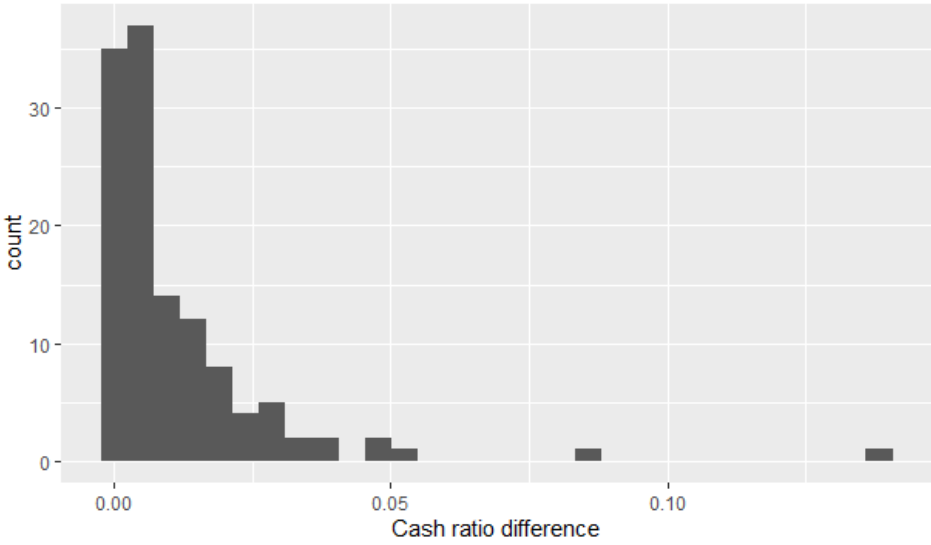
Figure 2. Histogram plot of the cash ratio difference
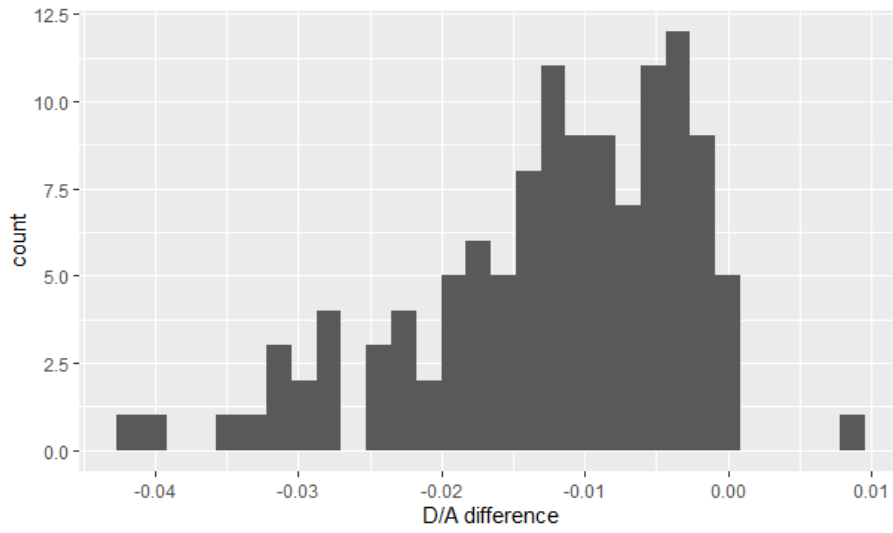
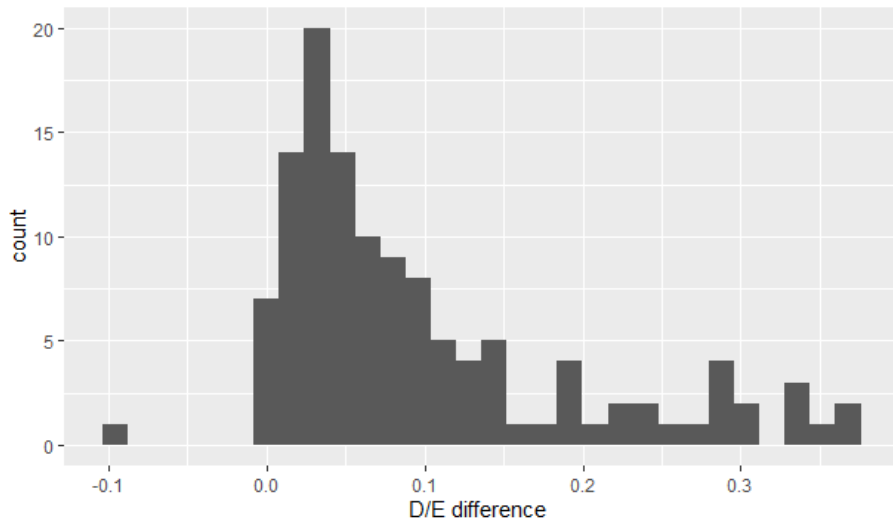*Figure 3.* Histogram plot of the D/A ratio difference

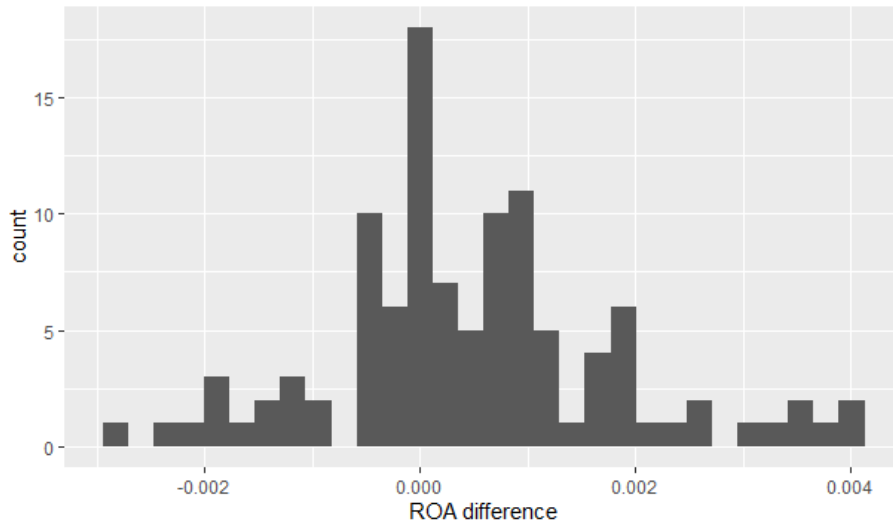*Figure 4.* Histogram plot of the D/E ratio difference

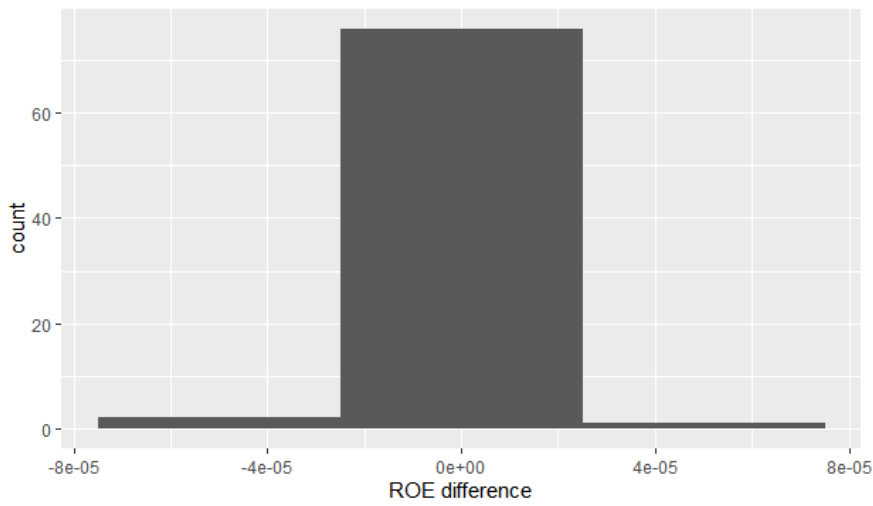*Figure 5.* Histogram plot of the ROA difference
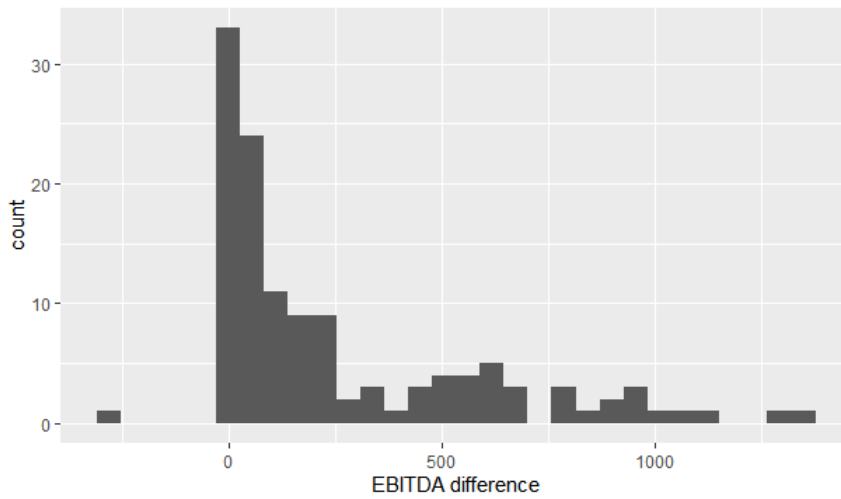

Figure 6. Histogram plot of the ROE difference

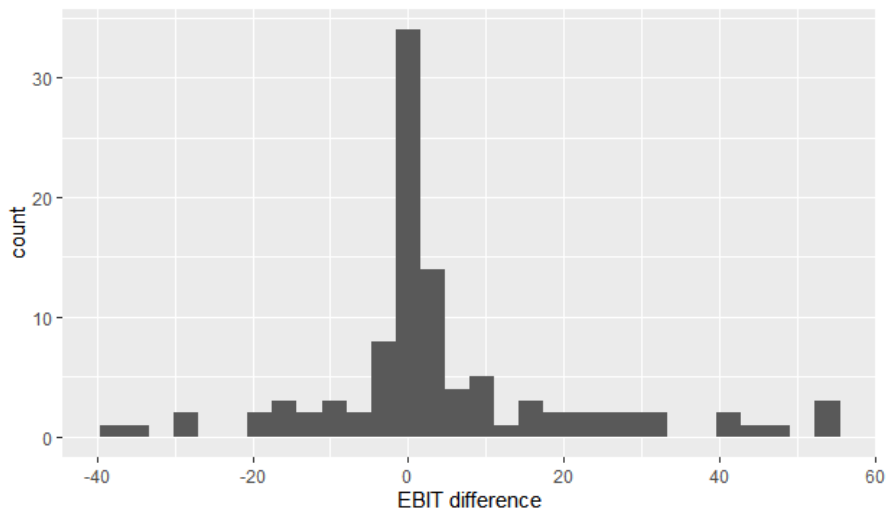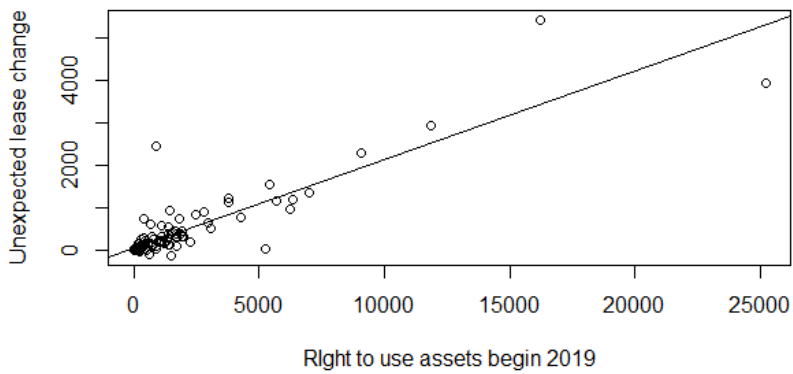*Figure 7.* Histogram plot of the EBITDA difference

Figure 8. Histogram plot of the EBIT difference

Figure 9. Scatterplot of the RUA begin 2019 and the unexpected lease change
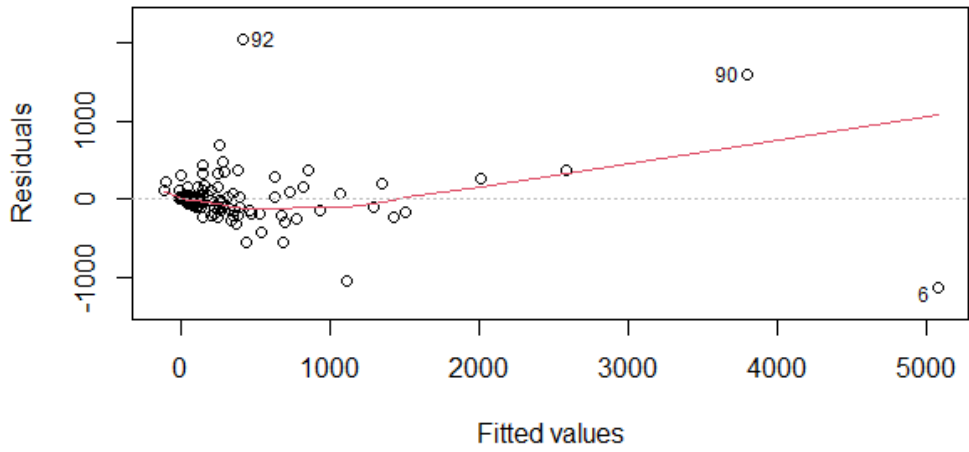
Figure 10. Scatterplot of the fitted values and residuals of model 2
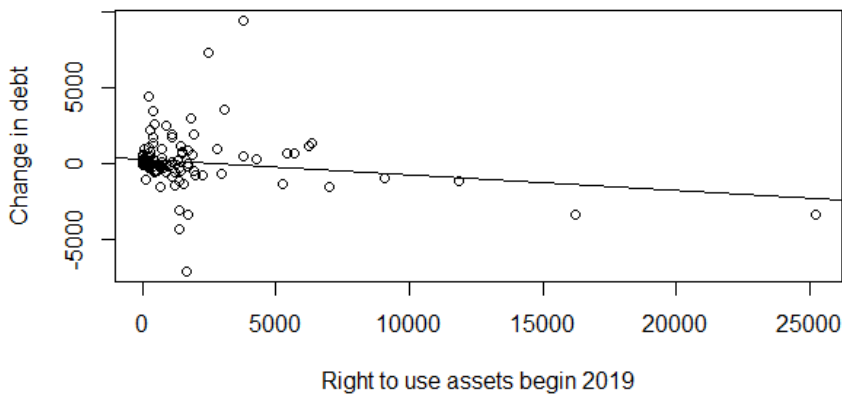
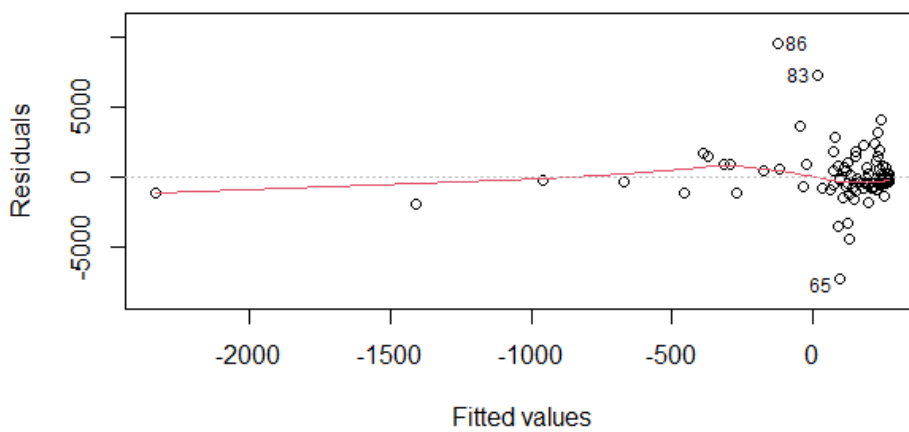*Figure 11.* Scatterplot of the RUA begin 2019 and change in debt

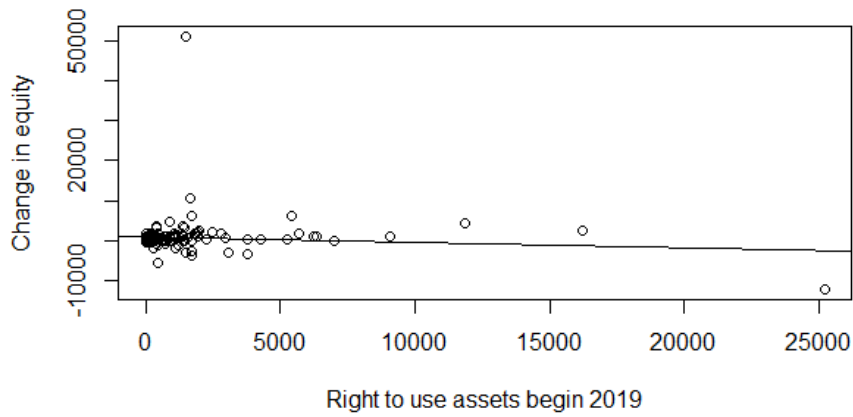*Figure 12.* Scatterplot of the fitted values and residuals of model 4

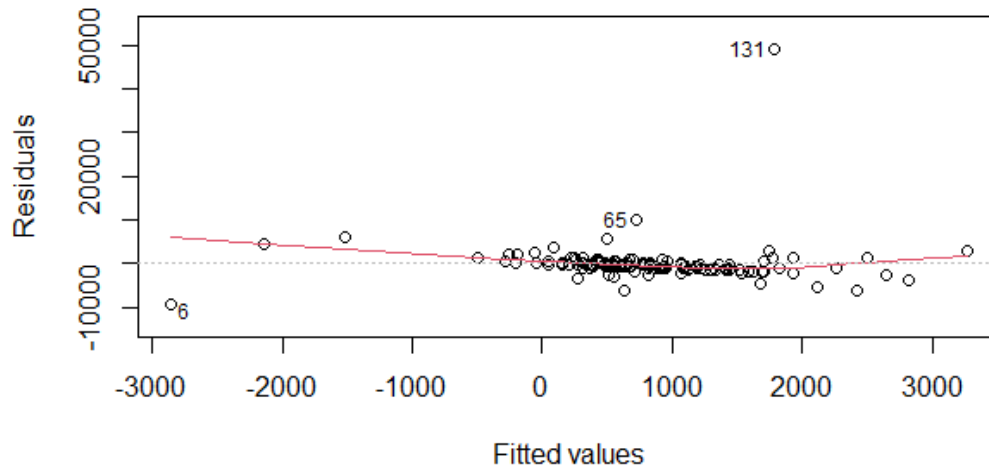*Figure 13.* Scatterplot of the RUA begin 2019 and the change in equity

Figure 14. Scatterplot of the fitted values and residuals of model 6