Determinants of the realization rate of housing associations in the Netherlands: an empirical analysis

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Abstract

This study investigates the investment behavior of housing associations in the Netherlands. Over the last decade, housing associations in the Netherlands seem to have trouble realizing their investment forecast of new housing. Housing associations argue that this is due to external factors influencing their realization rate (e.g., cooperation from municipalities, land availability, capacity of developers, economic situation etc.). Others argue that housing associations include their ambitions in their forecasts, rather than focusing on whether they can achieve their forecasts. This study investigates this, by examining the relationship between the financial position of housing associations and their realization rate (i.e., housing associations consider what they can afford, instead of what they can realize). Using data from the forecast year of 2017, this study finds a significant negative relationship between the ICR and the realization rate, where the realization rate tends to decrease by 26.5% as a result of a one-point increase in the ICR. Meaning that, if housing associations have a better financial position, they tend to perform worse in terms of their realization rate. This could be evidence that housing associations include their ambitions in their forecasts. Supplementary analyses show that the negative relationship holds for the North, South and West of the Netherlands and appears to be mainly driven by medium-sized (i.e., between 5000 and 10,000 rental spaces) and large-sized housing associations (i.e., between 10,000 and 25,000 rental spaces). For the East of the Netherlands and for small-sized housing associations (i.e., that own between 2500 and 5000 rental spaces) however, the relationship between the ICR and the realization rate appears to be positive. Additionally, housing market regions also seem to be of influence on the realization rate. Which could be evidence of external factors influencing the realization rate.

Keywords: Social Housing, Housing Associations, Realization Rate, Housing Supply

Section 1 Introduction

For a long time, it has been clear that there is a housing shortage in the Netherlands. The increasing number of households together with the decreasing supply of sufficient housing in the Netherlands is a problem. It is estimated that the shortage of houses in the Netherlands amounts to around 315.000 houses in 2022[1].

The Netherlands has a large degree of social housing supply. Housing associations in the Netherlands own around 27% of the housing stock (Elsinga and Wassenberg, 2014). Therefore, Boelhouwer (2020) sees potential in social housing to combat the housing shortage. The Authority of Housing Associations in the Netherlands (Aw) however, observes that housing associations are willing to build new houses (Staat van de corporatie sector, 2021[2]), but often fail to do so. In the last decade, housing associations forecast more new houses than they seem to be able to realize. With an average realization rate equal to only 61% in 2018, compared to 93% in 2013, housing associations seem to struggle with realizing their planned new housing (Final report realization power of housing associations, 2021). This makes it more difficult to know how many new houses to expect in the upcoming years, it does not give an accurate reflection of the financial position of housing associations and reduces their credibility (Staat van de corporatiesector, 2021). The Aw expects that the low realization rate is due to housing associations taking their ambitions into account (i.e., look at how many houses they can afford), rather than looking at what they can realize (Staat van de Corporatiesector, 2022). Housing associations themselves argue that this is due to external factors they are unable to control (Final report realization power of housing associations, 2021).

The aim of this study is to investigate determinants of the low realization rate. In particular, the potential relationship between the financial position of housing associations and their realization rate (i.e., does a better financial position lead to a lower realization rate, due to housing associations taking their ambitions into account). Additionally, supplementary analyses of the results are included to control for heterogeneity between housing associations located in different parts of the Netherlands and different sizes of housing associations. This study also examines whether different housing market regions within the Netherlands influence the realization rate (i.e., do external factors influence the realization rate). To answer the research questions, data of the Aw, WSW and BZK (i.e., dVi and dPi) is used, using the forecast year of 2017.

Based on the results of the regression analysis, we observe a significant negative relationship between de ICR and the realization rate. An increase of the ICR by one-point results in a decrease of the realization rate by 26.5% in the forecast year of 2017. This could be

[1] Calculation housing shortage in the Netherlands:
https://www.volkshuisvestingnederland.nl/onderwerpen/berekening-woningbouwopgave

[2] Staat van de corporatiesector is a snapshot of the state of the social rented sector in the Netherlands in the year of 2021.

evidence that housing associations include their ambitions within their forecast, which is in line with the expectations of the Aw (Staat van de Corporatiesector, 2022). Supplementary analyses show that the significant negative coefficient is relatively larger for regions where pressure on the housing market is higher (i.e., the South and West of the Netherlands) compared to regions where pressure on the housing market is lower. In the North of the Netherlands, we find a relatively smaller significant negative coefficient and in the East of the Netherlands we even find a positive relationship between the ICR and the realization rate. Furthermore, the negative relationship appears to be mainly driven by housing associations of size M (5000-10,000 rental spaces) and size L (10.000-25.000 rental spaces). The results of this study also show that housing market regions appear to be significant variables in explaining the realization rate. That is, being active in certain housing market regions results in a significant higher realization rate, while being active in certain other housing market regions results in a significant lower realization rate. This could be evidence of external factors influencing the realization rate.

By investigating the relationship between the financial performance of housing associations and their realization rate, this study contributes to the increasing literature on the determinants of the realization rate of housing associations in the Netherlands. It also adds to the literature of housing supply (i.e., why are certain companies able to realize their housing forecasts and others are not) and to the literature of the microeconomics influences on housing supply.

The remainder of this study is structured as follows: section 2 describes the background of the social housing sector in the Netherlands and the current housing shortage. Section 3 provides an elaborate literature review on housing supply and the realization rate. Section 4 gives a detailed description of the data, the sample, and the research design. Section 5 presents the result of the regression analysis and section 6 includes the supplementary analyses. Lastly, section 7 discusses and concludes the results.

Section 2 Background

Section 2.1 Background of the social housing sector in the Netherlands

To understand the underlying mechanisms, it is important to understand the social housing sector in the Netherlands. Housing associations were introduced halfway through the nineteenth century as part of a private initiative. As a result of population growth, overcrowding, cholera epidemics and poverty, housing was a major issue that needed attention. About 50 years later, in 1901, the Housing Act was introduced. The Housing Act became the foundation for housing associations as we know them today (Buitelaar et al., 2009). Since World War Two, government involvement in the housing sector increased. A major housing shortage and a demand to keep the wages down let the government to set rents below the free market level. Social housing was subsidized, and annual production was planned (Vermeulen and Rouwendal, 2007).

The social housing sector became financially independent again, after many years of deregulation in 1995, through the "grossing and balancing operation". The government wrote off all loans to housing associations and stopped subsidizing the industry. Consequently, the responsibility of housing supply became that of local governments and market parties (Vermeulen and Rouwendal, 2007). Today, housing associations must operate on a commercial basis and rely on the rent and sales of properties supported by financial management (Elsinga and Wassenberg, 2014). Despite being independent again, housing associations are still obligated to provide cheap housing for the lower income households in the Netherlands (Elsinga and Wassenberg, 2014). To achieve this, rent remains heavily regulated by the government (Gruis et al., 2004). The liberalization limit for rent is equal to 808.06 euro in 2023.[3] Housing associations are required to provide a minimum of 85% of their houses for the rent under this liberalization limit.[4] Housing associations are under the supervision of the Ministry of Housing, Spatial Planning and the Environment and must operate according to the Housing Act (Elsinga and Wassenberg, 2014).

Because of these regulations, rent received by housing associations is relatively low compared to the cost of providing new housing. Hence, housing associations struggle to receive a sufficient return for their investments. Consequently, housing associations invest with a certain unprofitable part (i.e., the part of the investment that will not be earned back).[5] This makes it crucial for housing associations to pay attention to their financial continuity. This is why housing associations are under the supervision of the Authority of Housing Associations (Aw) and the Dutch Social Housing Guarantee Fund (WSW) in the Netherlands. The goal of the Aw and WSW is to guarantee financial continuity of housing associations. Therefore, housing associations are required to have a minimum level of ICR[6], a maximum level of LTV[7] and a minimum level of solvability[8] (Gezamenlijk beoordelingskader Aw and WSW, 2022).

In the Netherlands, there are some three hundred housing associations that own around 2.3 million rentals in the Netherlands (see figure 1). This number has been quite steady over the last decade. The percentage of the total housing stock that housing associations own, has

[3] The liberalization limit for rental houses: https://www.rijksoverheid.nl/onderwerpen/woning-huren/vraag-en-antwoord/hoeveel-huur-betaal-ik-maximaal-voor-mijn-woning

[4] The requirements for housing associations: https://www.rijksoverheid.nl/onderwerpen/woning-verhuren/vraag-en-antwoord/wanneer-kom-ik-in-aanmerking-voor-een-sociale-huurwoning

[5] The unprofitable part of housing associations: https://fi-academy.nl/budgetteren-onrendabele-toppen/

[6] The ICR, the interest coverage ratio, determines how easily housing associations can pay their outstanding interest payments. Housing associations are required to have a minimum ICR of 1.4 for their DAEB activities and 1.8 for their non-DAEB activities.

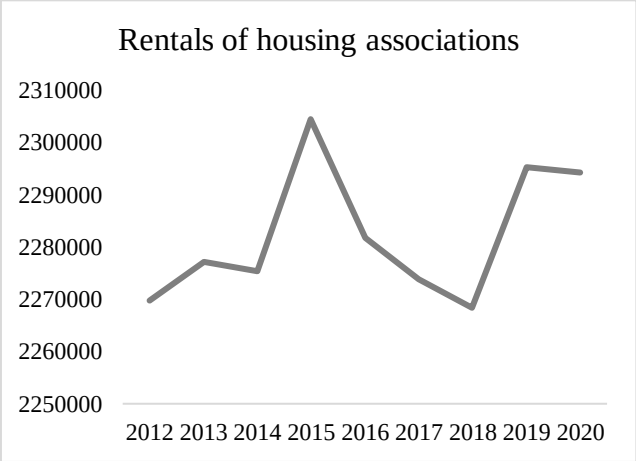
[7] The LTV, the loan to value ratio, is a ratio of housing associations of their outstanding loans to their policy value (*bedrijfswaarde before 2018 and beleidswaarde after 2018).* The policy value is equal to the net present value of de future cash flows based on their own policy. Housing associations are required to have a maximum LTV of 85% for their DAEB activities and 75% for their non-DAEB activities.

[8] Solvability is the ratio between debt and equity of a housing association. Housing associations are required to have a minimum solvability of 15% for their DAEB activities and a minimum of 40% for their non-DAEB activities.

been steadily decreasing over the last decade, from around 30.6% in 2012 to around 29% in 2020 (see figure 2).

Figure 1 and 2: Housing association rentals in the Netherlands[9]

Figure 1 shows the number of rentals owned by housing associations from 2012-2020. Figure 2 shows the percentage of housing stock owned by housing associations from 2012-2020.



Section 2.2 The housing shortage in the Netherlands

Currently, the Netherlands is dealing with housing shortage (estimated to be around 315,000 houses in 2022[10]). To combat this shortage, the national performance agreements have been introduced by the Ministry of Housing, Spatial Planning and the Environment in 2022[11]. The goal of this program is to build 900,000 new houses by 2030 and to increase the production of new houses to 100,000 houses each year. To contribute to this, housing associations agreed to build 250,000 houses for the lower income households and 50,000 houses for the middle-income households. However, some housing associations have already indicated that their capacity is too limited (Final report realization power of housing associations, 2021). The Aw also warns that it might take a while for housing associations to get their production up to speed and that the current macro-economic conditions are not suitable for a substantial increase in new housing (Staat van de corporatiesector, 2022). Additionally, the investment challenge for housing associations is expected to be huge in the coming year, as they do not only face the challenge of building new houses, but also need to focus on implementing sustainability into their investment strategy, on improving the quality of houses, on affordability of their houses

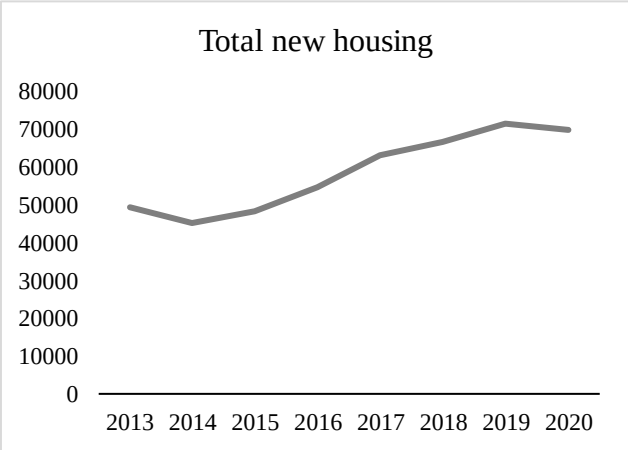
[9] Data of the figures originates from the Staat van de Woningmarkt (2021)
[10] The calculation of the housing shortage in the Netherlands: https://www.volkshuisvestingnederland.nl/onderwerpen/berekening-woningbouwopgave
[11] The national performance agreements: https://www.rijksoverheid.nl/actueel/nieuws/2022/06/30/kabinet-sluit-nationale-prestatieafspraken-volkshuisvesting-met-aedes-woonbond-en-vng

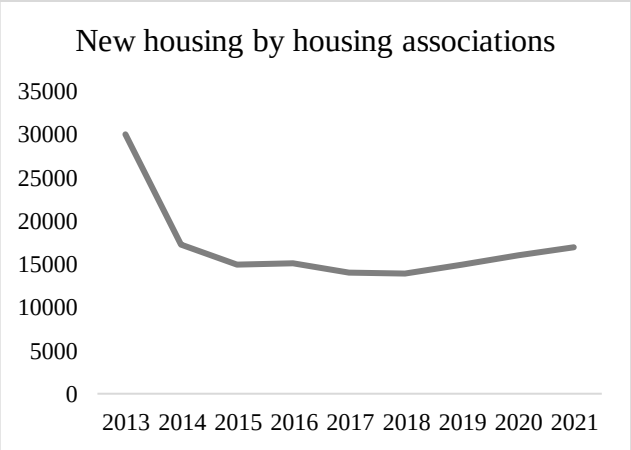
and on managing the quality of the living environment in and around the houses they provide (Staat van de corporatie sector, 2021).

In the period 2013 to 2020, the total supply of new housing in the Netherlands increased, from an additional 50.000 houses in 2013 to around 70.000 houses in 2020 (see figure 3). However, housing associations seem to struggle with keeping up to speed. The number of new houses supplied by housing associations decreased from around 30.000 new houses in 2013 to around 16.000 new houses in 2020 (see figure 4).

Figure 3 and 4: New housing in the Netherlands[12]

Figure 3 shows the total amount of new housing in the Netherlands from 2013-2020. Figure 4 shows the new housing build by housing associations in the Netherlands from 2013-2021.





Section 3 Literature review

Section 3.1 Determinants of housing supply

"The housing stock is an important asset and a substantial part of the nation's health. Understanding the supply of the market is crucial to understanding this market." (Dipasquale, 1999). In his article, Dipasquale (1999) noticed that the literature on the supply side of the housing market is still quite limited. Since the review article by Dipasquale, the literature has been growing. Regardless, Matysiak et al. (2021) still notice a research gap regarding the supply side of housing. What is recognized as a determinant of housing supply is the availability of land and local land use regulations (Buitelaar et al., 2009; Gyourko, 2009; Leishman, 2015). Additionally, price elasticity (i.e., the responsiveness of housing supply to changes in prices) seems to differ among countries. The price elasticity for the Netherlands appears to be quite low (Leishman, 2015). This unresponsiveness of the housing market in the Netherlands is most likely due to quirks in the housing market (i.e., the connection with land, long life expectancy

[12] Data of the figures originates from the staat van de woningmarkt (2021) and the staat van de corporatiesector (2021)

and government interference, Boelhouwer et al. 2006; Vermeulen and Rouwendal, 2007). Moreover, Leishman (2015) recognizes the importance of differences between firms. For example, firms differ in terms of capital intensity, production technology and size (i.e., smaller firms might have more difficulties accessing capital and more expensive borrowing). Leishman (2015) argues that the microeconomics of the housing industry deserves more attention.

Section 3.2 Determinants of housing supply by housing associations in the Netherlands

Buitelaar et al. (2009) also recognize the importance of the microeconomics of housing associations in the Netherlands, as they are often considered in its entirety. For this reason, Buitelaar et al. (2009) investigated firm-specific determinants of housing supply empirically. They observed that larger housing associations build more houses and that local circumstances seem to influence the production of new houses (i.e., less new housing in areas with less land availability, higher pressure on the housing market, higher house prices, high degree of social housing and stricter regulation). Additionally, housing associations with a better financial position (in terms of their solvability) tend to consider building new houses more quickly. However, they also observe that housing associations with a better financial position do not necessarily build more new houses. It is argued that this might be due to other investment decisions (i.e., renovation) or the core focus on financial continuity from the Aw.

The Aw also noticed that several other factors negatively influence the opportunities of housing associations to supply new housing. In most cases, the position of housing associations, as opposed to their competitors, who do not have to adhere to the strict rent regulations, is relatively weak. Moreover, it might take a while before the necessary permits for building new houses are received (Staat van de corporatiesector, 2021).

Section 3.3 Determinants of the realization rate

The struggle of housing associations to supply new housing in the last decade becomes apparent in their relatively low realization rate (i.e., the difference between the forecast of new houses and realization of new houses). While in 2013 the realization rate of housing associations was still 93%, this was only 61% in 2018 (Final report realization power of housing associations, 2021). This makes it more difficult to know how many new houses we can expect from housing associations in the coming years, which negatively affects their credibility (Staat van de corporatiesector, 2021). The RIGO published a report on the realization rate. They argue that the decrease in realization rate is most likely due to the Parliamentary Questionnaire for housing associations[13], the increasing effect of the taxation of housing associations, the introduction of the Landlord Levy and the limitations of the new Housing Act in 2015. These changes might

[13] The Parliamentary Questionnaire was introduced to investigate the social housing sector and the injustice that it could lead to, because of the scandal of Vestia (a large housing association in the Netherlands) in 2012: https://www.eerstekamer.nl/kamerstukdossier/parlementaire_enquete

have alarmed housing associations, turning their focus to governance and control, and reducing their budget for investments (Final report realization power of housing associations, 2021).

The RIGO also looked at potential determinants of the low realization rate. They found that XL associations (>25,000 rental units) and housing associations active in regions with high pressure on social housing mostly achieve high realization rates. Following the results of a questionnaire, potential fail factors for the realization rate of housing associations are being too optimistic, being risk averse, having strict return requirements, facing renegotiations with developers, and having an increasing sustainability demand. Furthermore, housing associations are also likely to increase their lending room of the WSW. External factors that might influence the realization rate are land availability, inflation, capacity of developers, delays because of procedures and staff shortage, the demand to become CO2-neutral and new regulations on Pfas and nitrogen. Housing associations claim that their low realization rate is mostly due to the external factors mentioned (Final report realization power of housing associations, 2021). However, the Aw suspects that housing associations include their ambitions in their forecasts, while failing to consider whether these ambitions are realizable (i.e., they only look at what they can afford, but not at what is achievable, Staat van de corporatiesector, 2022).

If housing associations include their ambitions in the forecasts, we would expect housing associations with a better financial position to have a lower realization rate. This is because housing associations mainly consider what they can afford in their forecasts, without assessing whether this is achievable. A higher ICR represents a better financial position, and thus we would expect a lower realization rate.

H1: Housing associations with a high realization rate have a lower ICR.

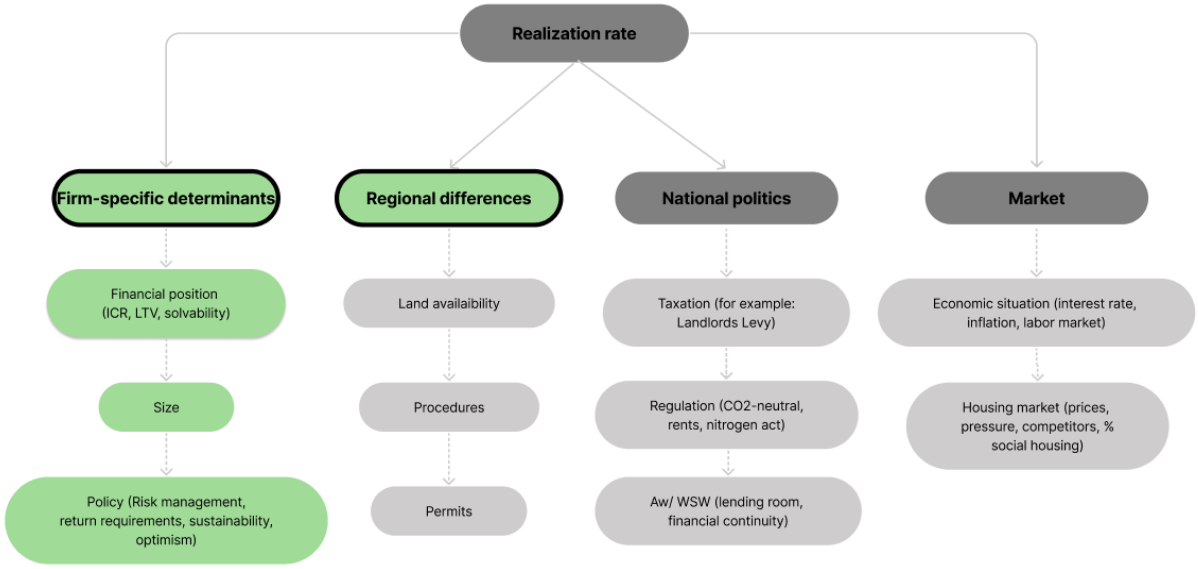
Housing associations mostly blame external factors for their low realization rate (Final report realization power of housing associations, 2021). If this were true, we would expect differences to mainly occur between regions, as the realization rates would be predominately determined by external factors within regions.

H2: Different influences of different housing market regions on the realization rate.

Figure 5 below summarizes the possible determinants of the realization rate based on the literature review. Within this study, we mostly focus on firm specific determinants of the realization rate. That is, the direct relationship between their financial position and the realization rate, controlling for other firm specific differences (with entity fixed effects) and size. We also look at the relationship between the realization rate and different regions (i.e., the housing market regions), to see whether potential differences in regional politics influence the realization rate. Determinants such as national politics and market-specific determinants are beyond the scope of this study.

Figure 5: Potential determinants of the realization rate

This figure summarizes the potential determinants for the realization rate into four distinct categories (i.e., firm-specific determinants, regional differences, national politics, and market determinants) based on the literature review.



Section 4 Research design

Section 4.1 Sample selection

Housing associations report their financial results each year to the Aw, WSW and BZK. This data is published on the website of the open data of the government[14]. From this we obtain data on the realization of new houses for the financial years of 2018-2021 (dVi[15]). Furthermore, we obtain data of the forecast year 2017 from the Aw. Within each year, the housing associations forecast five financial years ahead (i.e., for 2017 we already have four corresponding years with data on the realization of these forecasts). The data on forecast years (dPi[16]) is not published, and hence must be requested.

In the main analysis, the forecasts of the financial year of 2017 are used. This is the first forecast year of which we could obtain data, and therefore the year with the most known realizations (i.e., financial years of 2018-2021). By obtaining the forecasts and realization of these four financial years, we can calculate the realization rate.

From the financial year of 2017 onwards, multiple mergers between housing associations took place. To control for this, the variables of these associations are added together. Also, for the dependent variable and independent variable (i.e., realization rate and

[14] Data on the housing associations: https://www.ilent.nl/onderwerpen/publicaties-cijfers-en-wetgeving-autoriteit-woningcorporaties/publicaties-en-data/open-data
[15] The dVi reports the financial information of housing associations on their realization of a specific year.
[16] The dPi reports the forecasts of housing associations for 5 financial years ahead.

ICR respectively), we calculate a consolidated rate. This results in an original sample of 301 housing associations, with a total of 1204 observations (i.e., 301 housing associations with observations over four financial years).

Within the sample we are dealing with missing values, resulting from forecasts of zero new houses by housing associations (i.e., the formula of the realization rate divides by zero). Furthermore, there are a few extreme outliers within the realization rate (>600%). The missing values and outliers are dropped from the original sample, which results in a second sample of 971 observations over 274 housing associations. Because of this, the remaining panel is unbalanced.

To assess whether the independent variable and control variables are comparable between the remaining observations and the observations that are dropped from the sample, a Mann-Whitney U-Test[17] is performed on the average ICR, average size and average actual realization of the observations (see appendix A). Based on this test, we observe that the values for the ICR of the new group are not significantly different from the ICR of the missing values group (p>0.05). However, the average size of the missing values group is significantly lower compared to the new sample (p<0.05). Furthermore, the average actual realization from the missing value group is also significantly lower compared to the new sample group (p<0.05). This is not surprising, as we would expect smaller housing associations to have relatively more forecasts of zero new houses. Following this, the second sample holds a selection bias towards larger housing associations and housing associations that realize more houses. However, this does not seem to result in a significantly different ICR between the samples. Hence, we do not expect it to influence our identification.

Section 4.2 Research design

Section 4.2.1 Realization rate

In the regression analysis, the realization rate of housing associations in the Netherlands (=*RR*) is used as the independent variable. The realization rate is calculated based on the forecasts and realizations (i.e., including houses build for sale) of new houses obtained from the data of the dVi and dPi, based on the forecast year 2017.

The realization rate (RR) is calculated as

$$RR = \frac{New}{Forecast} \tag{1}$$

[17] The Mann Whitney U-test tests whether two summed ranks in 2 groups are equal. A Mann-Whitney U-test is preferred above a t-test because the Shapiro-Wilk test indicates that the variables are not normally distributed (Sainani, 2012)

where new is the amount of realized houses in a specific year and forecast is the forecasted number of houses for that specific year.

The number of houses realized and forecasted are calculated based on the weights for different rental spaces provided by the SBR (i.e., independent rental spaces, dependent rental spaces, units in care homes, social real estate, business units/ shops, parking spaces and remaining possessions). The weights used can be found in appendix B.

Section 4.2.2 Interest coverage ratio

For the regression analysis the interest coverage ratio (=*ICR*), is used.

The ICR is calculated as

$$ICR = \frac{OCF + IP - II}{IP} \tag{2}$$

where OCF is the operational cash flow, IP is the interest payment and II is the interest income.

For the ICR, the beginning of the forecast year is used as base year throughout the sample (i.e., the end of the financial year 2016 for the forecast year of 2017). This is because the forecasts of housing associations are based on the financial position of the forecast year.

Section 4.2.3 Housing market regions

This study also looks at differences in realization rates between regions. For the different regions, the housing market regions in the Netherlands are used (=*Regions*)[18]. The housing market regions and their corresponding municipalities are summarized in appendix C.

Additionally, in a supplementary analysis we control for the observed heterogeneity in different regions. For this we use the cardinal points (i.e., North, East, South and West). The provinces corresponding to the cardinal points are summarized in appendix G.

Section 4.2.3 The control variables

In the regression model there are a few control variables included. The first control variable to be included is the realization of new houses (=*New*). Furthermore, we also include size of housing associations (=*Size*) as control variable.

Additionally, in a supplementary analysis we control for the observed heterogeneity in the different sizes of housing associations. For this the different sizes of the housing

[18] https://www.regioatlas.nl/regioindelingen/regioindelingen_indeling/t/woningmarktregio_s

associations according to the Aedes benchmark are used, ranging from XXS to XL (the number of rental units per size can be found in appendix D).

Section 4.2.4 The statistical model

As the sample size is small, the distribution of the variables used in the model is determined. Following this, a Shapiro-Wilk test is performed (see appendix E), a statistical test to check whether the variables used in the regression model follow a normal distribution. The variables in the model are not normally distributed ($p < 0.01$). Furthermore, the residuals also do not follow a normal distribution ($p < 0.01$). However, transforming the data into a log function would result in a substantial loss of observations due to the creation of missing values (i.e., resulting from a realization rate of zero). Excluding these missing values would result in a more severe selection bias. Consequently, the decision was made not to transform the data.

To answer the research questions of this study, a fixed effects model is used. The fixed effects model controls for differences between entities and time. From the literature we know that housing associations are most likely to differ in terms of their risk management, return requirements and view on sustainability. By using entity fixed effects, we control for this difference. Furthermore, as certain financial years are further into the future, housing associations might struggle with making an accurate forecast for those years. This is why time fixed effects are also included. The fixed effects model is preferred above the random effects model, because the random effects model has strong assumptions to adhere to (i.e., the variation across entities is random and uncorrelated with the independent variables in the model, Schmidheiny, 2022). According to the Hausman test[19], using a fixed effects model is also more credible. The variables used for the regression analysis are summarized in appendix F.

The following econometric model will be estimated to assess the relationship between potential financial and non-financial factors and the realization rate:

$$RR = \alpha + \beta_1 ICR_{it} + \beta_2 Regions_{it} + \beta_3 New_{it} + \beta_4 Size_{it} + EntityDummies_t + TimeDummies_i + \varepsilon_i \quad (3)$$

where RR is the realization rate, ICR is the interest coverage ratio, Regions are the housing market regions, New is the realization of new houses, Size is the size of housing associations and EntityDummies and TimeDummies are the entity fixed effects and the time fixed effects. In the model i indicates firms, and t indicates time. The βs are the coefficients to be estimated and ε_i denotes the error term.

Furthermore, robust standard errors are used to control for heterogeneity.

[19] The Hausman test tests whether the random effects model will be suffering from the violation of the GaussMarkov theorem and end up with biased and inconsistent estimates (Schmidheiny, 2022)

Section 5 Results

Section 5.1 Descriptive statistics and pairwise correlation

Table 1: Descriptive statistics

Descriptive analysis of the dependent variable, the independent variable, and the control variables. This table reports the descriptive data of the variables represented in the regression model, for the forecast year of 2017. The realization rate is calculated based on the realization and forecasts for the financial years of 2018, 2019, 2020 and 2021. All variable descriptions can be found in appendix F.

VARIABLES	N	Mean	St. Dev.	Min	25%	Median	75%	Max
Realization rate	971	0.577	0.742	0	0	0	0.861	6
ICR	971	2.626	1.169	1.023	2.019	2.019	2.902	12.60
Realization	971	66.59	120.7	0	0	0	84	1,408
Size	971	9,302	11,400	0	2,568	2,568	10,943	79,341
Fryslân	971	0.0350	0.184	0	0	0	0	1
Limburg	971	0.0608	0.239	0	0	0	0	1
Zwolle - Stedendriehoek	971	0.0844	0.278	0	0	0	0	1
Noordoost Brabant	971	0.0247	0.155	0	0	0	0	1
Metropoolregio Amsterdam	971	0.0875	0.283	0	0	0	0	1
Noord-Holland Noord	971	0.0525	0.223	0	0	0	0	1
U16	971	0.0669	0.250	0	0	0	0	1
Groningen Drenthe	971	0.0649	0.246	0	0	0	0	1
Arnhem Nijmegen	971	0.0546	0.227	0	0	0	0	1
Haaglanden Midden-Holland Rotterdam	971	0.130	0.336	0	0	0	0	1
Zeeland	971	0.0247	0.155	0	0	0	0	1
Holland Rijnland	971	0.0402	0.196	0	0	0	0	1
Oost-Nederland	971	0.0546	0.227	0	0	0	0	1
Metropoolregio Eindhoven	971	0.0474	0.213	0	0	0	0	1
Woongaard	971	0.0360	0.186	0	0	0	0	1
Drechtsteden Hoeksche Waard	971	0.0237	0.152	0	0	0	0	1
Food Valley	971	0.0330	0.179	0	0	0	0	1
Amersfoort Noord-Veluwe Zeewolde	971	0.0278	0.165	0	0	0	0	1
West- en Hart van Brabant	971	0.0515	0.221	0	0	0	0	1

Table 1 presents the descriptive statistics of the variables used in this study. These descriptive statistics show a large variation in the realization rate, ranging from 0% (the lower bound) to 600% (the upper bound). Outliers above 600% are removed from the model (17 observations). The average realization rate is equal to 57.7%. Furthermore, the descriptives also show a large variation in the ICR, ranging from 1.023 to 12.6. The average ICR is equal to 2.626, which is way above the minimum requirements of the Aw (>1.4). The regions are mostly equally divided; however, relatively more observations are from the region Haaglanden Midden-Holland Rotterdam.

Table 2: Correlation matrix

The correlation between the dependent variable, the independent variable and control variables. This table reports the correlations between the variables represented in the regression model. All variable descriptions can be found in the table in appendix F. Furthermore, ***, ** and * indicate the significance level of 1%, 5% and 10% respectively.

Variables	(1)	(2)	(3)	(4)
(1) Realization rate	1.000			
(2) ICR	-0.041	1.000		
(3) Size	0.053*	-0.209***	1.000	
(4) Realization	0.332***	-0.116***	0.584***	1.000

Table 2 presents the correlation matrix of the variables represented in the regression analysis. Based on the correlation matrix, we already observe significant correlation between the control variables (i.e., realization and size) and the realization rate. Based on the table, we do not observe highly correlated variables (i.e., a correlation higher than 0.7). Therefore, we do not expect multicollinearity to occur in our model.

Section 5.3 Regression analysis

In table 3 below, the results for the ordinary least squared regression (without control variables and with control variables), the fixed effects model and the random effects model are summarized. Below, the results for the fixed effects model are interpreted, because, as mentioned in section 4, this model is more credible due to controlling for firm specific differences and time fixed effects.

Regression (3) shows that the ICR is a significant variable (p<0.05) in explaining the realization rate of the housing associations, indicating a negative relationship between the ICR and the realization rate. This implies that when the ICR of a housing association increases by one point, the realization rate tends to decrease by 26.5%. Based on the significant negative relationship, hypothesis one is accepted. These results are in line with the expectations of the Aw, that housing associations include their ambitions the forecasts (Staat van de corporatiesector, 2022).

Based on regression (3), we also observe that different housing market regions seem to influence the realization rate. We observe that being active in the housing market region

Limburg tends to decrease the realization rate by 67.5% (p<0.01), being active in Zwolle-Stedendriehoek tends to decrease the realization rate by 35.5% (p<0.1), being active in Metropoolregio Amsterdam tends to decrease the realization rate by 468%, (p<0.01), being active in Noord-Holland Noord tends to decrease the realization rate by 32.7% (p<0.05), being active in U16 tends to decrease the realization rate by 287.1% (p<0.01), being active in Groningen Drenthe tends to increase by 81.2% (p<0.01), being active in Haaglanden Midden-Holland Rotterdam tends to decrease the realization rate by 58.1% (p<0.01), being active in Zeeland tends to decrease the realization rate by 110.4% (p<0.01), being active in Metropoolregio Eindhoven tends to decrease the realization rate by 51.2% (p<0.01), being active in Drechtsteden Hoeksche Waard tends to decrease the realization rate by 45.8% (p<0.01), being active in Food Valley tends to reduce the realization rate by 40.7% (p<0.01) and being active in West en Hart van Brabant tends to decrease the realization rate by 149% (p<0.01). These regions seem to be significant regions in explaining the realization rate, indicating a negative relationship between these housing market regions and the realization rate. Based on regression (3), being active in Holland Rijnland tends to increase the realization rate by 8% (p<0.01), being active in Oost Nederland tends to increase the realization rate by 247.4% (p<0.05) and being active in Amersfoort Noord-Veluwe Zeewolde tends to increase the realization rate by 47.1% (p<0.1). These regions are also significant in explaining the realization rate, indicating a positive relationship between these housing market regions and the realization rate. Furthermore, for the regions Noordoost Brabant, Arnhem Nijmegen and Woongaard we do not find a significant coefficient, meaning that we cannot conclude with certainty that these regions influence the realization rate. Based on these results, hypothesis two is accepted. These results are in line with previous papers investigating regional factors influencing the realization of new houses (see, e.g., Dipasquale, 1999; Boelhouwer et al., 2006; Vermeulen and Rouwendal, 2007; Buitelaar et al., 2009; Gyourko, 2009; Leishman, 2015). The results are also in line with the findings of the RIGO. In this report, they find that housing associations believe that they are influenced by external factors that influence the realization rate (Final report realization power of housing associations, 2021).

Based on regression (3) we also find small significant (p<0.01) relationships between the realization rate and size (*=-0.000*) and the actual realization of new houses (*=0.004*).

Table 3: Regression analysis OLS, FE and RE-model

The impact of the ICR and housing market regions on the realization rate.
This table reports an ordinary least squared regression, a fixed effects model, and a random effects model. The regression analysis determines the impact of the ICR and regions on the realization rate, based on data of the forecast year 2017. The realization rate is based on the realization and forecasts of the financial years of 2018 to 2021. All variable descriptions can be found in appendix F. The FE-model includes time fixed effects and entity fixed effects. The random effects model includes random effects. Furthermore, ***, ** and * indicate the significance level of 1%, 5% and 10% respectively.

	OLS	OLS	FE-model	RE-model
	(1)	(2)	(3)	(4)
VARIABLES	Realization rate	Realization rate	Realization rate	Realization rate
ICR	-0.026*	-0.027*	-0.265**	-0.027*
	(0.015)	(0.015)	(0.123)	(0.015)
Size		-0.000***	0.000***	-0.000***
		(0.000)	(0.000)	(0.000)
Realization		0.003***	0.004***	0.003***
		(0.001)	(0.001)	(0.001)
Limburg		-0.153	-0.675***	-0.153
		(0.128)	(0.208)	(0.128)
Zwolle - Stedendriehoek		-0.083	-0.355*	-0.083
		(0.119)	(0.185)	(0.119)
Noordoost Brabant		-0.038	0.305	-0.038
		(0.184)	(0.199)	(0.184)
Metropoolregio Amsterdam		-0.424***	-4.680***	-0.424***
		(0.135)	(0.817)	(0.135)
Noord-Holland Noord		-0.117	-0.327**	-0.117
		(0.119)	(0.136)	(0.119)
U16		-0.379***	-2.871***	-0.379***
		(0.105)	(0.369)	(0.105)
Groningen Drenthe		-0.313***	-0.812***	-0.313***
		(0.106)	(0.260)	(0.106)
Arnhem Nijmegen		-0.182	-0.131	-0.182
		(0.124)	(0.180)	(0.124)
Haaglanden Midden-Holland Rotterdam		-0.154	-0.581***	-0.154
		(0.113)	(0.182)	(0.113)
Zeeland		-0.241	-1.104***	-0.241
		(0.192)	(0.417)	(0.192)
Holland Rijnland		-0.059	0.080***	-0.059
		(0.185)	(0.027)	(0.185)
Oost-Nederland		-0.093	2.474**	-0.093
		(0.115)	(1.102)	(0.115)
Metropoolregio Eindhoven		-0.200	-0.512***	-0.200
		(0.125)	(0.153)	(0.125)
Woongaard		-0.181	-0.111	-0.181
		(0.171)	(0.210)	(0.171)
Drechtsteden Hoeksche Waard		-0.066	-0.458***	-0.066
		(0.224)	(0.058)	(0.224)
Food Valley		0.005	-0.407***	0.005
		(0.156)	(0.137)	(0.156)
Amersfoort Noord-Veluwe Zeewolde		0.118	0.471*	0.118
		(0.223)	(0.260)	(0.223)
West- en Hart van Brabant		-0.116	-1.490***	-0.116
		(0.120)	(0.245)	(0.120)
Constant	0.643***	0.736***	1.155***	0.736***
	(0.049)	(0.112)	(0.443)	(0.112)
Observations	971	971	971	971
Number of housing associations	274	274	274	274
RE	NO	NO	NO	YES
Time FE	NO	NO	YES	NO
Entity FE	NO	NO	YES	NO
R-squared overall	0.002	0.169	0.450	0.169

Section 6 Supplementary analyses

Following the results of the main regression and the literature on housing supply and the realization rate, we know that regions and size are of influence on the realization rate. The supplementary analyses focus on the effect of heterogeneity between regions (i.e., the North, East, South and West of the Netherlands) and heterogeneity in sizes (i.e., XXS, XS, S, M, L and XL) on the relationship between the ICR and the realization rate.

Section 5.3 Supplementary analyses on regions

Table 4 presents the coefficients with additional control variables (i.e., size and realization) for the regression analysis on different parts of the Netherlands, using a fixed effects model. The descriptive statistics can be found in appendix H. The results suggest that the negative relationship between the realization rate and the ICR holds in the North, South and West of the Netherlands. A one-point increase in the ICR of a housing association tends to decrease the realization rate in the North by 3.5% (p<0.01), in the South by 8.8% (p<0.01) and in the West by 10.7% (p<0.01). In the East of the Netherlands the opposite relationship between the ICR and the realization rate appears to be true. A one-point increase of the ICR tends to increase the realization rate by 1.8% (p<0.01) for housing associations. The results suggest that the negative coefficient reflecting the relationship between the ICR and the realization rate is relatively larger in regions where the pressure on the housing market is high (i.e., the West and South of the Netherlands, BPD Hittekaart, 2022[20]). In these regions housing associations might experience more pressure to provide new housing, while Buitelaar et al. (2009) observed that in regions where the pressure on the housing market is high, less new housing is realized. Hence, these housing associations might have more incentive to include their ambitions in the forecasts, while struggling to a greater extend with realizing their ambitious forecasts. This negative effect appears to be relatively lower in parts of the Netherlands where pressure on the housing market lower (i.e., the North of the Netherlands) and even appears to be positive in the East of the Netherlands. In these parts of the Netherlands housing associations have less incentive to build more new houses and are to a greater extend able to provide new housing. Additionally, based on the descriptive statistics in appendix H, we observe that the mean forecast of housing associations in the North and East of the Netherlands is relatively lower. Furthermore, housing associations in the East are relatively smaller compared to the other regions.

[20] The BPD Hittekaart is a yearly research where BPD maps the strong and weak regions within the Dutch housing market based on a couple of factors (i.e., housing prices, sales of houses and household growth) https://www.bpd.nl/actueel/persberichten/bpd-hittekaart-2022-woningmarkt-kookt-droog/

Table 4: Regression analysis stratified by regions

The impact of the ICR on the realization rate of housing associations located in the North, East, South and West of the Netherlands. This table reports a fixed effects model. The regression analysis determines the impact of the ICR on the realization rate restricted to different regions, based on data of the forecast year 2017. The realization rate is based on the realization and forecasts of the financial years of 2018 to 2021. All variable descriptions can be found in appendix F. The FE-model includes time fixed effects and entity fixed effects. Furthermore, ***, ** and * indicate the significance level of 1%, 5% and 10% respectively.

	North	East	South	West
	(1)	(2)	(3)	(4)
VARIABLES	Realization rate	Realization rate	Realization rate	Realization rate
ICR	-0.035***	0.018***	-0.088***	-0.107***
	(0.000)	(0.006)	(0.009)	(0.004)
Covariates	YES	YES	YES	YES
Observations	75	248	213	435
Number of housing associations	21	70	62	121
Time FE	YES	YES	YES	YES
Entity FE	YES	YES	YES	YES
R-squared overall	0.630	0.440	0.562	0.451

Section 5.3 Supplementary analyses on sizes

Table 5 presents the coefficients with additional control variables (i.e., realization and regions) for the regression analysis on different sizes of housing associations, using a fixed effects model. The descriptive statistics can be found in appendix H. Based on the results in table 5, we find no significant effect of the ICR on the realization rate for the sizes XXS, XS and XL. Therefore, we cannot say with certainty that these coefficients are different from zero. For housing associations of size S, size M and size L we do find evidence of a significant effect of the ICR on the realization rate. Based on the results, the negative relationship between the ICR and the realization rate appears to be mainly driven by medium-sized (i.e., between 5000 and 10,000 rental spaces) and large-sized housing associations (i.e., between 10,000 and 25,000 rental units). A one-point increase in the ICR tends to decrease the realization rate by 8.7% (p<0.01) for medium-sized housing associations and 14.5% (p<0.01) for large-sized housing associations. Hence, a better financial position appears to negatively affect their realization rate. For housing associations that own between 2500 and 5000 rental units (i.e., of size S) however, the effect of the ICR on the realization rate appears to be positive. Meaning that, if the ICR of these housing associations increases by one point, the realization rate tends to increase by 2.4% (p<0.01). Hence, a better financial position

appears to help small-sized housing associations realize a higher realization rate. As Leishman (2015) argued, smaller firms might have more difficulties accessing capital and face more expensive borrowing. A better financial position might help them accessing capital and give them access to cheaper borrowing, which could also help them realize their forecasts.

Table 5: Regression analysis stratified by sizes

The impact of the ICR on the realization rate for housing associations with size XXS, XS, S, M, L or XL. The corresponding number of rental units for size can be found in appendix D This table reports a fixed effects model. The regression analysis determines the impact of the ICR on the realization rate restricted to different sizes, based on data of the forecast year 2017. The realization rate is based on the realization and forecasts of the financial years of 2018 to 2021. All variable descriptions can be found in appendix F. The FE-model includes time fixed effects and entity fixed effects. Furthermore, ***, ** and * indicate the significance level of 1%, 5% and 10% respectively.

	XXS	XS	S	M	L	XL
VARIABLES	Realization rate	Realization rate	Realization rate	Realization rate	Realization rate	Realization rate
ICR	0.001	0.002	0.024***	-0.087***	-0.145***	0.064
	(0.020)	(0.012)	(0.009)	(0.013)	(0.027)	(0.041)
Covariates	YES	YES	YES	YES	YES	YES
Observations	45	174	215	260	198	75
Number of housing associations	18	55	57	71	52	19
Time FE	YES	YES	YES	YES	YES	YES
Entity FE	YES	YES	YES	YES	YES	YES
R-squared overall	0.693	0.491	0.607	0.619	0.609	0.537

Section 6 Conclusion and discussion

This study contributes to the discussion about the causes of the low realization rate of housing associations over the last decade. In this study, we investigated a possible relationship between the ICR and the realization rate. Using a fixed effects model with data on 274 housing associations in the Netherlands and 971 observations over four financial years, the results find evidence of a negative relationship between the ICR and the realization rate. Based on the forecast year of 2017, the results suggest that an increase in the ICR by one point, decreases the realization rate by 26.5%. Hence, a better financial position negatively influences the realization rate. This is most likely due to housing associations including their ambitions in their forecasts,

which is in line with the expectations of the Aw (Staat van de corporatiesector, 2022). That is, they forecast new houses that they can afford without assessing whether they can be realized (i.e., in terms of land availability, capacity of developers, cooperation of municipalities etc.). These results also seem to be in line with the observations of the Aw that housing associations are willing to build houses even though are often unable to do so (Staat van de corporatiesector, 2021). Furthermore, we also find evidence that different regions seem to influence the realization rate. This appears to be in line with the findings of other papers that investigated the supply side of the housing market (see, e.g., Dipasquale, 1999; Boelhouwer et al., 2006; Vermeulen and Rouwendal, 2007; Buitelaar et al., 2009; Gyourko, 2009; Leishman, 2015) and the papers that reported on the realization rate of housing associations (see, e.g., Final report realization power of housing associations, 2021; Staat van de Corporatiesector, 2022).

The findings of the main regression and the literature suggest heterogeneity between different sizes and regions of housing associations. The supplementary analyses control for this heterogeneity. The results suggest that the negative relationship between the ICR and the realization rate holds in the North, West and South of the Netherlands. Furthermore, the negative effect of the ICR on the realization rate appears to be the largest in regions where pressure on the housing market is higher (i.e., South and West). In these regions, there is a lot of pressure to build new houses, while Buitelaar et al. (2009) also found that it is more difficult to realize new housing in regions where pressure on the housing market is high. Therefore, it is possible that especially in these regions, housing associations would include their ambitions in the forecasts, while also struggling with realizing these ambitious forecasts. In regions with less pressure on the housing market, we find a smaller negative effect (i.e., North). For the East of the Netherlands we even find a small positive effect of the ICR on the realization rate. Furthermore, it appears that the negative relationship between the ICR and the realization rate is mainly driven by medium-sized and large-sized housing associations. Regarding small-sized housing associations, we find a small positive relationship between the ICR and the realization rate. A better financial position might help small-sized housing associations to attract more capital and borrow cheaper (Leishman, 2015). Future research could focus more on the mechanisms behind the observed differences in sizes.

This study distinguishes itself from other studies that investigate the realization rate, by empirically examining the financial position of housing associations as a possible microeconomic determinant of the realization rate, using a fixed effects model to control for differences in time and entities and data of the forecast year 2017. This study also empirically investigates deviations in regional effects on the realization rate. The results are also controlled for heterogeneity in sizes and regions, and show that the negative relationship is consistent in the North, South and West of the Netherlands and mainly appears to be present within medium-sized and large-sized housing associations.

Due to missing values, resulting from forecasts of zero houses, 233 observations were dropped from the model. This resulted in an unbalanced panel. Furthermore, due to these

missing values in the sample, the sample also has a selection bias towards larger housing associations and housing associations that realize more housing. However, this selection does not seem to influence the average ICR within the sample. Hence, we do not expect that this results in a bias of the identification.

Furthermore, the distribution of the variables and the residuals represented in the model is non-normal. Transforming the data would have resulted in a substantial loss of observations due to the creation of missing values. This is why, looking at a potential selection bias, it is decided not to transform the data into log functions. This study does account for extreme outliers in the realization rate to reduce the skewness, by dropping these outliers from the model.

Additionally, this study only considers one forecast year. Therefore, it was not possible to examine potential effects of the introduction of policy changes (e.g., the national performance agreements, the Nitrogen Act, and the abolition of the Landlord Levy). For future research it would be interesting to examine the effects of these abolished or newly introduced policies when more data becomes available, as literature argues that these policies and interventions of the government influence the realization rate.

The results highlight the importance of housing associations to take a realistic look at their forecasts. While to a certain extent the lower realization rates can be explained by regional factors, we also see a clear influence of the financial position of housing associations on the realization rate. Especially in the coming years, when pressure on providing new houses is high, due to for example the introduced national performance agreements by the Ministry of Housing, Spatial Planning and the Environment. That is, housing associations should not only look at how many houses they are able to afford, but also at how many new houses they are able to achieve. This is especially important because a low realization rate results in a loss of credibility of housing associations, it does not give an accurate reflection of their financial position and it does not give an accurate reflection of how many houses to expect in the future (i.e., it might appear as though housing associations are going to realize more houses than eventually would be the case). Therefore, it is important for housing associations to keep sight of reality. This is especially important for housing associations located in regions where pressure on the housing market is high and for medium-sized and large-sized housing associations.

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Appendix

Appendix A

Table 6: Mann-Whitney U-test ICR

This table shows the Mann-Whitney U-test performed on the ICR, determining whether there is a significant difference between the missing values group (that will be dropped from the model) and the non-missing values group (the definite sample).

Group	N	Mean Rank	Sum of Ranks
Missing	197	116544.5	115146.5
New sample	971	566151.5	567549.5
Total	1168	682696	682696
Z	0.324		
Prob >	z	=	0.7460

Table 7: Mann-Whitney U-test Size

This table shows the Mann-Whitney U-test performed on the size, determining whether there is a significant difference between the missing values group (that will be dropped from the model) and the non-missing values group (the definite sample).

Group	N	Mean Rank	Sum of Ranks
Missing	233	68150.5	140382.5
New sample	971	657259.5	585027.5
Total	1204	725410	725410
Z	-15.155		
Prob >	z	=	0.0000

Table 8: Mann-Whitney U-test Realization

This table shows the Mann-Whitney U-test performed on the actual realization, determining whether there is a significant difference between the mean of the missing values group (that will be dropped from the model) and the mean of the non-missing values group (the definite sample).

Group	N	Mean Rank	Sum of Ranks
Missing	233	78882.5	140382.5
New sample	971	646527.5	585027.5
Total	1204	725410	725410
Z	-13.346		
Prob >	z	=	0.0000

Appendix B

Table 9: Weights different rental spaces

This table summarizes the weights used to arrive at the number of new housing being forecasted by housing associations and realized new housing. These weights are based on the instructions to fill out the dPi[21].

Kinds of housing	**Weights**
Living spaces	
Independent rental houses	1
Dependent rental houses	1
Units in care homes	1
Remaining rental units	
Social real estate	2
Business units/ shops DAEB and non-DAEB	1
Parking spaces	0.2
Remaining possessions	0.2

Appendix C

Table 10: Dutch housing market regions[22]

This table summarizes the different Dutch housing market regions with their corresponding municipalities.

Region	**Municipalities**
Amersfoort Noord-Veluwe Zeewolde	Amersfoort Bunschoten Elburg Harderwijk Nijkerk Oldebroek Soest Zeewolde Baarn Eemnes Ermelo Leusden Nunspeet Putten Woudenberg
Arnhem Nijmegen	Arnhem Beuningen Druten Heumen Montferland Overbetuwe Rheden

[21] Weights for the different kinds of rental spaces: https://servicedesk.sbr-wonen.nl/support/solutions/articles/75000088319--2-1-is-de-weging-van-gewogen-aantal-eenheden-gelijk-aan-het-voorgaande-jaar-

[22] Different housing market regions: https://www.regioatlas.nl/regioindelingen/regioindelingen_indeling/t/woningmarktregio_s

	Westervoort Zevenaar Berg en Dal Doesburg Duiven Lingewaard Nijmegen Renkum Rozendaal Wijchen
Drechtsteden Hoeksche Waard	Alblasserdam Goeree-Overflakkee Hoeksche Waard Sliedrecht Dordrecht Hendrik-Ido-Ambacht Papendrecht Zwijndrecht
Food Valley	Barneveld Renswoude Scherpenzeel Wageningen Ede Rhenen Veenendaal
Fryslân	Achtkarspelen Dantumadiel Harlingen Leeuwarden Ooststellingwerf Schiermonnikoog Súdwest-fryslân Tytsjerksteradiel Waadhoeke Ameland De Fryske Marren Heereveen Noardeast-Fryslân Opsterland Smallingerland Terschelling Vlieland Weststellingwerf
Groningen Drenthe	Aa en Hunze Assen Borger-Odoorn Coevorden De Wolden Eemsdelta Emmen Groningen Het Hogeland Hoogeveen Meppel Midden-Drenthe

	Midden-Groningen Noordenveld Oldambt Pekela Stadskanaal Tynaarlo Veendam Westerkwartier Westerveld Westerwolde
Haaglanden Midden-Holland Rotterdam	's-Gravenhage Albrandswaard Barendrecht Bodegraven-Reeuwijk Brielle Capelle aan den IJssel Delft Gouda Hellevoetsluis Krimpen aan den IJssel Krimpenerwaard Lansingerland Leidschendam-Voorburg Maassluis Midden-Delfland Nissewaard Pijnacker-Nootdorp Ridderkerk Rijswijk Rotterdam Schiedam Vlaardingen Waddinxveen Wassenaar Westland Westvoorne Zoetermeer Zuidplas
Holland Rijnland	Alphen aan den Rijn Hillegom Kaag en Braassem Katwijk Leiden Leiderdorp Lisse Nieuwkoop Noordwijk Oegstgeest Teylingen Voorschoten Zoeterwoude
Limburg	Beek Beekdaelen Beesel Bergen (L)

	Brunssum Echt-Susteren Eijsden-Margraten Gennep Gulpen-Wittem Heerlen Horst aan de Maas Kerkrade Landgraaf Leudal Maasgouw Maastricht Meerssen Mook en Middelaar Nederweert Peel en Maas Roerdalen Roermond Simpelveld Sittard-Geleen Stein Vaals Valkenburg aan de Geul Venlo Venray Voerendaal Weert
Metropoolregio Amsterdam	Aalsmeer Almere Amstelveen Amsterdam Beverwijk Blaricum Bloemendaal Diemen Edam-Volendam Gooise Meren Haarlem Haarlemmermeer Heemskerk Heemstede Hilversum Huizen Landsmeer Laren Lelystad Oostzaan Ouder-Amstel Uithoorn Velsen Waterland Wijdemeren Wormerland Zaanstad Zandvoort

Metropoolregio Eindhoven	Asten Bergeijk Best Bladel Cranendonck Deurne Eersel Eindhoven Geldrop-Mierlo Gemert-Bakel Heeze-Leende Helmond Laarbeek Nuenen, Gerwen en Nederwetten Oirschot Reusel-De Mierden Someren Son en Breugel Valkenswaard Veldhoven Waalre
Noord-Holland Noord	Alkmaar Bergen (NH) Castricum Den Helder Dijk en Waard Drechterland Enkhuizen Heiloo Hollands Kroon Hoorn Koggenland Medemblik Opmeer Schagen Stede Broec Texel Uitgeest
Noordoost Brabant	's-Hertogenbosch Bernheze Boekel Boxtel Heusden Land van Cuijk Maashorst Meierijstad Oss Sint-Michielsgestel Vught
Oost-Nederland	Aalten Almelo Berkelland Borne Bronckhorst Dinkelland

	Doetinchem Enschede Haaksbergen Hellendoorn Hengelo (O) Hof van Twente Losser Oldenzaal Oost-Gelre Oude IJsselstreek Rijssen-Holten Tubbergen Twenterand Wierden Winterswijk
U16	Bunnik De Bilt De Ronde Venen Houten IJsselstein Lopik Montfoort Nieuwegein Oudewater Stichtse Vecht Utrecht Utrechtse Heuvelrug Wijk bij Duurstede Woerden Zeist
West-Brabant en Hart van Brabant	Alphen-Chaam Baarle-Nassau Bergen op Zoom Breda Dongen Drimmelen Etten-Leur Geertruidenberg Gilze en Rijen Goirle Halderberge Hilvarenbeek Loon op Zand Moerdijk Oisterwijk Oosterhout Roosendaal Rucphen Steenbergen Tholen Tilburg Waalwijk Woensdrecht Zundert
Woongaard	Altena

	Buren Culemborg Gorinchem Hardinxveld-Giessendam Maasdriel Molenlanden Neder-Betuwe Tiel Vijfheerenlanden West Betuwe West Maas en Waal Zaltbommel
Zeeland	Borsele Goes Hulst Kapelle Middelburg Noord-Beveland Reimerswaal Schouwen-Duiveland Sluis Terneuzen Veere Vlissingen
Zwolle-Stedendriehoek	Apeldoorn Brummen Dalfsen Deventer Dronten Epe Hardenberg Hattem Heerde Kampen Lochem Noordoostpolder Olst-Wijhe Ommen Raalte Staphorst Steenwijkerland Urk Voorst Zutphen Zwartewaterland Zwolle

Appendix D

Table 11: Number of rental units for different sizes

This table summarizes the different sizes according to the Aedes benchmark for housing associations.

Size	**Number of rental units**
XXS	<1000 rental units
XS	1000-2500 rental units
S	2500-5000 rental units
M	5000-10.000 rental units
L	10.000-25.000 rental units
XL	25.000 rental units

Appendix E

Table 12: Shapiro-Wilk test

This table represents the outcome for the Shapiro-Wilk test performed on the dependent, independent and control variables represented in the model. This test tests for normality.

Variable	Obs	W	V	z	Prob>z
Realization rate	971	0.818	111.888	11.668	0.000
ICR	971	0.629	228.068	13.430	0.000
Size	971	0.663	206.849	13.188	0.000
Realization	971	0.615	236.637	13.521	0.000
Residuals	971	0.652	213.546	13.267	0.000

Appendix F

Table 13: Variables

This table summarizes the dependent, independent and control variables used in the regression models, including how they are measured and their source.

Variables	Measures	Source
Dependent variable		
Realization Rate	The number of realized houses in a specific year divided by the forecasted number of houses of that specific year.	dVi and dPi
Independent variables		
ICR	Adding the interest payment to the operational cash flow and subtracting the interest income. This is then divided by the interest payment.	dVi
Regions	Dutch housing market regions.	The municipalities corresponding to the different market regions are from the dVi. These are then linked to a housing market region.
Control variables		
Realization new houses	The number of realized houses in a specific year.	dVi
Size	The size of the housing associations.	dVi
Supplementary analyses		
Regions	North, East, South and West of the Netherlands	Aedes Benchmark
Size	XXS, XS, S, M, L, XL	Aedes Benchmark

Appendix G

Table 14: Corresponding provinces to the cardinal points

This table summarizes the different provinces corresponding to the different cardinal points in the Netherlands.

Cardinal points	Provinces
North	Utrecht, Noord-Holland, Zuid-Holland, Zeeland
East	Overijssel, Flevoland, Gelderland
South	Noord-Brabant, Limburg
West	Groningen, Friesland, Drenthe

Appendix H

Table 15: Mean statistics subsample regions

The different means of the dependent variable, the independent variable, and the control variables for the subsample consisting of the different parts of the Netherlands (i.e., north, east, south and west). This table reports the descriptive data of the variables represented in the regression model, for the forecast year of 2017. The realization rate is calculated based on the realization and forecasts for the financial years of 2018, 2019, 2020 and 2021. All variable descriptions can be found in appendix F.

VARIABLES	North (*N*=75)	East (*N*=248)	South (*N*=213)	West (*N*=435)
Realization rate	0.603	0.584	0.611	0.552
ICR	2.854	2.709	2.629	2.538
Size	8399.939	6977.09	8536.117	11159
Realization	73.853	45.488	68.839	76.270
Forecast	107.187	84.334	119.581	155.090

Table 16: Mean statistics subsample size

The different means of the dependent variable, the independent variable, and the control variables for the subsample consisting of different sizes of the housing associations (i.e., XXS-XL). This table reports the descriptive data of the variables represented in the regression model, for the forecast year of 2017. The realization rate is calculated based on the realization and forecasts for the financial years of 2018, 2019, 2020 and 2021. All variable descriptions can be found in appendix F.

VARIABLES	XXS (*N*=49)	XS (*N*=174)	S (*N*=215)	M (*N*=260)	L (*N*=198)	XL (*N*=75)
Realization rate	0.329	0.508	0.585	0.634	0.578	0.680
ICR	9712.949	3.116	2.746	2.493	2.350	2.132
Size	661.714	1671.934	3677.403	7320.382	14481.98	41972.76
Realization	4.327	14.784	30.642	59.015	92.823	287.533
Forecast	12.449	33.207	60.516	103.907	179.968	531.202