Residential real estate, must have assets for private investors? The influence of macroeconomic and political factors on pricing and capital allocation.

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Abstract

This paper discusses the conditions that stimulated private investors into real estate. Macroeconomic and political factors have been studied. The data set used consists of the returns on investment in real estate in the Netherlands from 1980 until 2018. Also, macroeconomic and other investment returns have been added to the dataset. In conclusion, we cannot establish that macroeconomic factors influence the attractiveness of individuals to invest in real estate. Political decisions over time seem to be of greater importance to the attractiveness of investing in real estate as an individual.

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1 Introduction

In recent times residential real estate investments have become increasingly popular among Dutch private investors. To develop an understanding of the reasons driving this trend this paper seeks to find correlations between real estate prices and ownership versus a set of economical and political factors. The Dutch residential real estate sector has not always enjoyed the current level of popularity among private investors. In fact, it was dominated by professional real estate investors, while the share of privately-owned residential real estate was in decline for a long time. A decade and a half ago this trend reversed. Research shows an increase of 75% in acquisitions by private real estate investors between 2006 and 2016 (Aalbers, Bosma, Fernandez, & Hochstenbach, 2018).

One of the possible drivers of the popularity that has been cited is the fact that house prices have been surging. Swiss bank UBS publishes annually a report that puts the real estate housing market into long-term perspective and tracks the risk of property price bubbles in global cities, the UBS Global Real Estate Bubble Index (UBS, 2021). The index analyses residential property prices in 25 major cities around the world. The index has categorized Amsterdam as a bubble risk for the fourth consecutive time in 2022. However, extreme rises in house prices are not a phenomenon of recent years only. (Knoll, Schularick, & Steger, 2017) find steep house price growth in several major economies, including the Netherlands, already since World War II.

In public opinion, there is widespread disagreement among real estate commentators on the cause of the ongoing rise in house prices in recent times. Some argue that the insufficient supply of new housing in combination with an increase in the number of new households due to immigration is driving up the prices. This could be the case as from 2013 onwards there was a sharp decline in the number of new buildings realized, especially during the last four years (Boelhouwer, 2019) and this could well be linked to the fact that it became less easy to find land for development (Anacker, 2019). Other commentators however point to professional (foreign) real estate investors as the driving force behind surging house prices (Rodriguez & Bustillo, 2008).

Other factors that are cited are the access to quick and relatively cheap capital versus what owner-occupiers can spend on a property to be driving up the house prices in the bidding process combined with an attractive tax regime that makes it possible to buy a more expensive house or even to buy more than one property (Aalbers, Bosma, Fernandez, & Hochstenbach, 2018). Several regulations have been adjusted by the national government to make it more attractive for private real estate investors. For example, the possibility to provide shorter rental contracts and ask for more rent for an apartment. Lastly, (Amador-Torres, Gomez-Gonzalez, & Sanin-Restrepo, 2018) find that the influence of politics by prolonged monetary policy easing increases the duration of housing price bubbles.

The question arises why exactly investing in residential property has become attractive for private investors. This paper aims to answer that question in a two-step approach. The first step is to understand what the returns have been on residential real estate investments for private individuals. Also, a brief discussion on the use of a general rent-to-price ratio of homeowners and investor data is provided. In the second step the paper studies the influence of macroeconomic and political factors on choosing

residential real estate as the preferred investment category for private individuals.

The two research questions have been answered on the basis of a data set collected from real estate auctions from the Eerste Amsterdamse (Eerste Amsterdamse, 2021). This auctioneer hosts real estate auctions since mid 20th century throughout the Netherlands and collects information about the auctioned properties. More on the collected data is explained in section 3. A regression model has been used to determine the influence of different macroeconomic factors on private real estate investors' decision-making. The dependent variable is the change in the percentage of houses that are owned by private real estate investors in Amsterdam. Independent variables taken are Total return, the stock price (AEX/CBS), mortgage rate, unemployment rate, population change, change in properties, government bond percentage, and the change in the number of households.

We cannot draw a straight conclusion on the regression results on all macroeconomic variables. Unemployment rate showed a negative influence on net yield but on the other hand a positive influence on total return and the change in ownership by private real estate investors. Furthermore, Net yield is negatively influenced by population which contradicted the estimation. All regressions have been done against macroeconomic factors. Not finding strong correlations versus these factors, suggest that other, namely the political/fiscal factors seem to influence private real estate owners and their returns to a larger extent.

After this short introduction, the rest of the paper is organized into seven more sections. Section 2 provides a review of applicable literature. Section 3 elaborates on the data sources. In section 4 the returns on residential real estate investments for private investors are established. Section 5 provides an analysis of the model and the regressions that will be done. In section 6 the results of the regression analyses are presented for yield curves and private ownership percentages respective. In section 7 the conclusions of the research are presented. In the appendix, the correlation table on the tested variables is provided.

2 Literature review

In general, theoretical and empirical work on linking the macroeconomy to real estate returns has in the past been extremely limited and focused primarily on the question of whether real estate returns are ”sensitive” to various economic events or factors (Naranjo & Ling, 1997). In later years research starts to appear on several macroeconomic factors that influence investors to buy property. (Sutton, 2002) finds for example that over long periods, stock prices and house prices move together in six countries (the USA, the UK, Canada, Ireland, The Netherlands, and Australia). Furthermore, there is literature on the mortgage interest rate as an important variable influencing investors to buy a property (Mohan, Hutson, MacDonald, & Lin, 2019). This paper shows that an increase in the mortgage rate makes it more expensive to buy a house and so less attractive for investors to invest in a property as the return is reduced because of the higher mortgage payment. (de La Paz & White, 2012) studied macroeconomic factors for the UK housing market. They find a cointegrating relationship between house prices and variables such as mortgage lending, net migration, and interest rates. Moreover, (Abelson, Joyeux, Milunovich, & Chung, 2005) did research in Australia and found that unemployment rate, real mortgage rates, equity prices, and housing stock have a negative effect on house prices. They also state that it is expected that population size and the total number of households will have a positive influence on the percentage of private real estate investors because more people and more households suggest the need for more houses. (Rossall Valentine, 2015) divided the demand-side drivers of UK house price inflation into three categories. The first category is population, which includes immigration and domestic population growth. Secondly, incentives, include interest rates, government assistance, and tax incentives to overseas buyers. The third category comprises financial factors including demand from domestic and foreign private investors and the large-scale availability of buy-to-let mortgages.

Besides macroeconomic factors, individual public education factors play a role in the popularity of investing in real estate. Concepts such as the movement financial independent retire early (FIRE) attract interest to invest in real estate. (Carson, 2018) published a best-selling book about early retirement through real estate investing in order to escape the 9 to 5 grind. Literature refers to a “peer” effect. Inexperienced investors entered housing markets after observing other investors in their close network. It was established that substantial numbers of investors entered the market as a direct result of observing investing activity of multiple forms in their own neighbourhoods and that these “infected” investors performed poorly relative to other investors along several dimensions (Bayer, Mangum, & Roberts, 2021).

There is also literature on trade-offs that private investors make. Opening a savings account at a bank, and buying stocks, bonds, or other financial products are all investments that take less effort than buying real estate. A real estate investment involves several risks and costs, such as maintenance costs, mortgage payments, or the risk of a non-paying tenant. Despite these risks and costs, individual investors still see the opportunity to make a return on capital on real estate rather than investing in other financial assets. Looking at the return and risk profile, residential real estate is laid between government bonds and the stock market (Lennartz, Schilder, & van der Staak, 2019). Despite these risks and costs, (Gallent, Durrant, & Stirling, 2018) find that there is a transformation of housing from serving households for

shelter, to an investment and savings vehicle. They establish that the transformation was facilitated by low-interest rates and long-term house price appreciation.

An important reason for investing in real estate is to use the property as a pension reserve. Some individuals worry about the future value of their pensions when they retire. More and more individuals lose their confidence in the stock market. Most pensions rely on the performance of stock market assets and therefore real estate seems to be a steady alternative (Edwards, 2016). However, buying another property does not always have to deal with a bad stock market performance. Buying an extra property could also serve several other purposes such as insurance for setbacks or as an allowance for their children (Doling & Ronald, 2010).

Furthermore, it became easier to finance real estate investments. Where before 2015, private investors depended on their house bank to finance real estate investments, the market for buy-to-let mortgages opened up more options from companies such as RNHB, NIBC, and Domivest who became large providers of buy-to-let mortgages (den Brinker & Trappenburg, 2021). Often, it is possible for buy-to-let investors to pay more for a property than a potential owner-occupier. Financing is possible with the investment value of the property. This is the price that an investor would like to pay based on his expected return. Where owner-occupiers have several restrictions on their maximum mortgage (Conijn, Meertens, & Schilder, 2019). Another economic effect that has been described is that there is an accelerating effect. Once a property has been acquired this can be used to accumulate. Use the property they already own as security for the loans needed to acquire additional property (Gallent, Durrant, & May, 2017).

Location seems to be of importance where to buy a property. The long-term house appreciation in the London housing market has marked the city as a safe investment haven (Sivitanides, 2018). Other global cities are also cited as a safe deposit box for the capital of wealthy investors all over the world (Fernandez, Hofman, & Aalbers, 2016). Globally residential real estate is now a key store of wealth for households and investors (Melser & Hill, 2018).

3 Data

3.1 Residential property data

The starting point of the data on residential real estate consists of the property transactions from real estate auctioneer the Eerste Amsterdamse for the period between 1979 and 2019, making up a total of 4902 property transactions. For most transactions, this auctioneer collected the following transaction variables: location, size, rental income, type of auction, taxes, sales price, and buyers' and sellers' names. The data set did however not contain all of these variables for all auctions results. As a minimum, the variables rent, sales price, and surface are required as these are essential to measuring the yield and eventually the return of a property. Therefore transactions that did not include these variables were taken out of the data set. Furthermore, this dataset showed large differences in the rent per square meter. After a detailed review, it transpired that not every property has the function of residential real estate but that commercial real estate and a garage were also included. Google Maps and its function *Street View* helped to identify if a property with a large difference in price compared to the other properties was commercial or residential. In total 632 transactions were deleted from the data set as well as 80 duplicate transactions. Finally, one other outlier was removed from the sample that was not representative in terms of price and rent in 1992. After cleaning a data set with 2460 property transactions resulted, relating to a total of 2329 properties. The sample cleaning process is detailed in Table 1.

Table 1: Sample selection of property transactions from real estate auctioneer the Eerste Amsterdamse for the period between 1979 and 2019.

Changes	**Transactions**
Property transactions from auctioneer the Eerste Amsterdamse from 1980 to 2018	4902
Less: commercial real estate or garages	632
Less: no information on rent, sales or surface of the property	1729
Less: duplicate transactions	80
Less: outlier	1
Final Sample (2329 properties)	**2460**

3.2 Macroeconomic data

As tabled in the introduction, several macroeconomic variables could be an explanation for the change in the percentage of residential real estate owned by private investors. To construct the regression model variables have been collected from different data sources. As the real estate dataset mainly consists of transactions from Amsterdam, the majority of the macroeconomic variables have been collected for the municipality of Amsterdam. For the larger part, the data originated from CBS (Centraal Bureau voor de Statistiek, 2021) and historical CBS (CBS, 2021). CBS is a public data source in the Netherlands that provides variables on a regional level, including the Amsterdam area. Next to CBS, information from the Nederlandsche Bank (DeNederlandscheBank, 2021), which is the Dutch central bank, has

been collected. To complete the set of variables information from the papers Financieel Dagblad (Financieel Dagblad, 2021), *Dure huizen maar geen zeepbel in Amsterdam* (Korevaar, Francke, & Eichholtz, 2021)and Nul20 (NUL20, 2022), and the statistics section of the municipality of Amsterdam was added (Gemeente Amsterdam, 2022)

More specifically the data on total housing stock, unemployment rates, total households, and consumer price index was collected from CBS (Centraal Bureau voor de Statistiek, 2021). As mentioned in the introduction, (Abelson, Joyeux, Milunovich, & Chung, 2005) find that unemployment, housing stock, and total households have negative effects on house prices. The question arises if they also have a negative effect on the change in private real estate investors or real estate returns. The consumer price index data has been used to correct other data elements for inflation. Rent, sales price, local tax, and ground lease have all been corrected for inflation to the base year 1980. Data on the percentage of private rent houses in Amsterdam has been collected from (NUL20, 2022). Population numbers came from the statistics of (Gemeente Amsterdam, 2022). Historical mortgage interest rates for the period between 1980 and 2003 have been collected from (historical) CBS (Centraal Bureau voor de Statistiek, 2021). The years 2003 until 2019 have been collected from the Nederlandsche Bank (DeNederlandscheBank, 2021). (Mohan, Hutson, MacDonald, & Lin, 2019) already noticed that the mortgage rate is an important factor in investing in real estate. To collect historical stock exchange averages from AEX for the period, the CBS index was used to fill in the years between 1980 and 1984, because the AEX did not exist in that period. The CBS index can be compared to the AEX index. For the period after 1984 the AEX index is used and retrieved from historical CBS, Financieel Dagblad (Financieel Dagblad, 2021), and the Nederlansche Bank (DeNederlandscheBank, 2021). Lastly, data on government bonds have been collected from the paper *Dure huizen maar geen zeepbel in Amsterdam* (Korevaar, Francke, & Eichholtz, 2021). The AEX index and government bonds are used to investigate if private investors invest in real estate as an alternative investment to stocks and bonds as another interesting investment.

3.3 Overview of statistics variables

Tables 2 and 3 below present the summary of the variables in the models. The tables show for each variable the total observations, means, standard deviations, minimum, maximum, and the median. In Table 2 for example, a mean is shown of 0,112 for Net Yield and 77.710 for Sales price respectively. Table 3 shows the descriptive statistics for the variables of the regression model. At first glance, the table reveals high values for the Total return mean (0,137) and standard deviation (0,143). As these are absolute numbers, for the actual regression the log of total return has been applied. The median is added to look at the distribution of the data. The mean and median of a symmetric distribution are close together, while in a skewed distribution the mean is farther out in the long tail than is the median (Moore, McCabe, Alwan, Craig, & Duckworth, 2016). For example, the mean of Private rent change is -0,032 and the median is -0,036. This suggests that there is a normal distribution. The other variables in Table 3 also seem to be normally distributed, which makes them suitable to be processed in the regression analysis.

Table 2: Descriptive Statistics components total return from 1980 until 2018.

Variable	Obs	Mean	Std. dev.	Min	Max	Median
Sales price	2.460	77741,41	250000,6	536	6348123	27792
Rent	2.460	6941,229	11321	207	213361	4804
Capital Gain	2.467	0,024	0,143	-0,296	0,226	0,046
Gross Yield	2.460	0,187	0,141	0,003	3,343	0,171
Net Yield	2.460	0,112	0,084	0,002	2,006	0,103

Table 3: Descriptive Statistics variables regression model from 1980 until 2018.

Variable	Obs	Mean	Std. dev.	Min	Max	Median
Private rent	2.467	-0,032	0,018	-0,052	0,042	-0,036
Total return	2.467	0,137	0,143	-0,273	2,156	0,147
Stock return	2.467	0,097	0,165	-0,304	0,500	0,035
Mortgage rate	2.467	0,079	0,019	0,024	0,109	0,076
Population	2.467	-0,001	0,010	-0,019	0,017	0,000
Properties	2.467	0,010	0,006	0,000	0,038	0,010
Households	2.467	0,015	0,008	0,000	0,027	0,017
Unemployment rate	2.467	0,066	0,015	0,033	0,090	0,067
Government bond	2.467	0,075	0,023	0,003	0,116	0,072

4 Determinants of aggregate returns over the long run

4.1 Definition of returns on residential real estate investments

The accurate measurement of real estate return is highly important to real estate investors (Lin & Liu, 2008). Therefor a clear definition of return is required. The yearly return in year t on rental housing investments for consists of both capital gains and net rental yields and can be described by the following formula:

$$Return\ i,t\ =\ \frac{Pi,t-Pi,t-1}{Pi,t-1}+\frac{Ri,t(1-ci,t-t,i,t)}{Pi,t-1}$$

Pi,t and Ri,t equal the market price and rent of the same property i at time t. In the next paragraph, the approach to establishing the capital gains and yields are described including the assumptions on costs involved and taxes on properties included.

4.2 Calculation of returns

4.2.1 Capital gains

As described above, first of all, a way to make a return on a property is due to capital appreciation or capital growth of the asset. The return is made with an increase in the value of the property, adjusted for capital expenditures when it is being sold at a profit (Reid, 2019). However, capital appreciation is not guaranteed on every property. Nevertheless, investors are not deterred by this argument. They have easy access to equity and many of these investors may simply have been betting that the boom would continue for a while longer (Bayer, Geissler, Mangum, & Roberts, 2020).

There are several methods to estimate house price indices. According to many studies, it is hard to estimate a proper house price appreciation. Due to limitations in data availability, long-term series of house prices are frequently built with different datasets. (Eichholtz, Korevaar, Lindenthal, & Tallec, 2020) mentioned these datasets are built on thin databases and often splice together indices constructed with different methods, from different localities, and based on different housing quality segments. Also, (Chambers, Spaenjers, & Steiner, 2019) address the capital gain of properties and common biases and mistakes. Investors do not adequately check for changes in the quality composition of real estate. Furthermore, investors will only realize capital gains in line with a quality-adjusted price index if they properly maintain their property. Lastly, there is a "superstar city bias" for national capitals and other large cities. These capitals and large cities are known to have had a higher-than-average rate of price appreciation historically (Chambers, Spaenjers, & Steiner, 2019). For this paper, the dataset from the Eerste Amsterdamse has been analyzed with the repeat sales method to arrive at a capital gains percentage.

In this paper the capital gain is estimated using the following formula:

$$Capital\ gain\ i,t\ =\ \frac{Pi,t-Pi,t-1}{Pi,t-1}$$

After calculating the capital gain for every property, the exponential growth per year was established. Exponential growth is useful for economic growth and capturing the increase of an amount of money over time. Taking the exponential growth of every property made the capital gain also more realistic over time. Analysis of the data results in an average annual capital gain corrected for inflation of 2,4% and a median percentage of 5,6%. This result is based on 123 properties with at least two transactions of a property. To estimate the capital gain for every year there are not enough transactions in the dataset. Therefore, I will make use of the real house price index of (Korevaar, Francke, & Eichholtz, 2021). Showing the statistics of other literature, (Demers & Eisfeldt, 2021) find an average capital gain of 4,3% in the United States over a period from 1986 to 2014, (Chambers, Spaenjers, & Steiner, 2019) find an average rate of 0,2% between 1901 and 1970 in the United Kingdom, and (Eichholtz, Korevaar, Lindenthal, & Tallec, 2020) find an average of 2,6% capital gain in Amsterdam between 1900 and 1979.

4.2.2 Yields

The second way a return can be made on a residential is by letting it out. A return is generated because tenants pay a fixed amount per month (Paccoud, 2016). These are known as Buy-to-rent investors or as buy-to-let (BTL) in the UK (Bracke, 2019). Rental yields are most of the time absent in prior research because data on the cash flows of real estate are hard to obtain. Variables needed to calculate the yield such as rental income, sales price, and costs are not widely available to the public. Organizations such as Kadaster and the Nederlandse Coöperatieve Vereniging van Makelaars (NVM) do have data on transactions and income from real estate but are cautious with providing this data to the public or to academic researchers. Furthermore, existing data capture contractual rental income rather than realized income, which can lead to overstated rental yields (Chambers, Spaenjers, & Steiner, 2019). Moreover, in some cases, research data is collected from different sources to estimate yields and total returns. This could lead to false outcomes or measurement errors over time.

In this study, this shortcoming has been avoided. Auctioneer The Eerste Amsterdamse provided data with rental and sales prices for the period between 1980 and 2019. An estimation is therefore not necessary. To estimate the gross annual rental yield of a property, the rental prices are divided by the sales price of the property (Eichholtz, Korevaar, Lindenthal, & Tallec, 2020). In this study, the gross yields are based on the yearly rental price, which is corrected for inflation, and the sales prices, which are also corrected for inflation.

The final step to find net yields is to convert the gross rental yields to net rental yields, using the estimates of costs, taxes, and vacancy rates. These costs will be estimated in the next section. I use the formula below, where the annual rental yield is reduced with the cost variables mentioned and then divided by the sales price.

$$Yi,t\ =\ \frac{Ri,t(1-ci,t-t,i,t)}{Pi,t-1}$$

The average gross yield has a percentage of 18,70% and the median gross yield has a percentage of

17,10%. After subtracting the percentage of costs as explained in the costs section, the average net yield of the sample is 11,20% and the median net yield has a percentage of 10,25%. Figure 1 below shows the net yield over time.

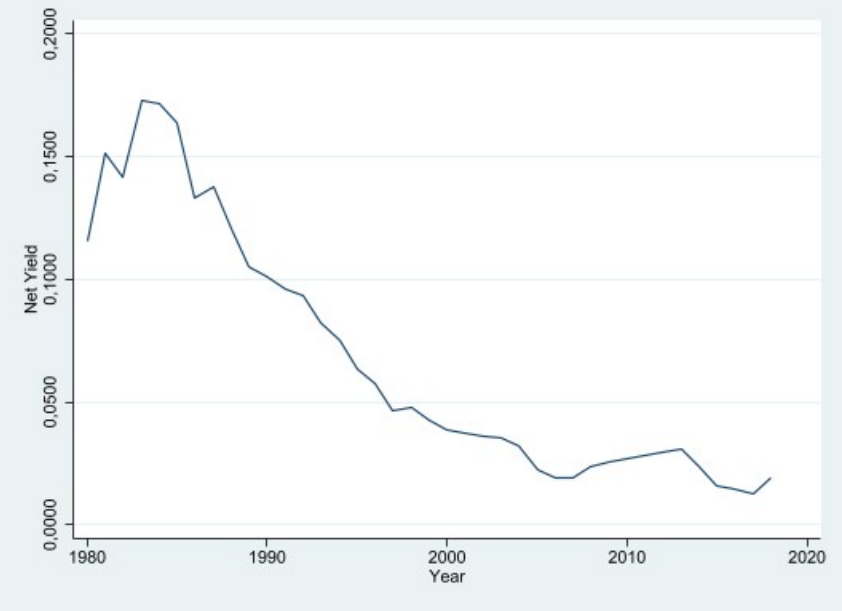

Figure 1: Average net yield from 1980 till 2018

Looking at the statistics of (Demers & Eisfeldt, 2021), they find an average net yield of 4,2%, (Chambers, Spaenjers, & Steiner, 2019) find an average rate of 2,8%, and (Eichholtz, Korevaar, Lindenthal, & Tallec, 2020) find an average of 5,4%. We see a large difference in percentages compared to the other papers. A brief explanation could be that periods are different. However, another more reasonable explanation of the large difference is that we see in the sample very high yields in the 1980s, because of the high mortgage interest rates in that period of 8 to 11 per cent. A high return should have been made to at least pay the mortgage on a property in that period. From the mid-nineties, we see comparable yields with the other papers.

Recently, a debate has emerged on the use of private investor data or an existing homeownership price-to-rent index. Corresponding literature by (Hilber & Mense, 2021) finds that the increase in the price-to-rent ratio in Greater London is unlikely materially affected by global investor demand for second homes. On the other hand, (Greenwald & Guren, 2021) argue that the relative elasticities of the price-rent ratio and homeownership with respect to an identified credit shock is a sufficient statistic to measure the degree of segmentation. Figure 1 shows the average net yield of the hand-collected private investor data, while Figure 2 below shows the CBS rent-to-price index from 1996 till 2018. This index calculates the yield of homeowners if they would rent out their property. Looking at both figures, we notice a comparable development over time from 1996. However, further research is necessary to find if an existing index is sufficient to use in researching private investors.

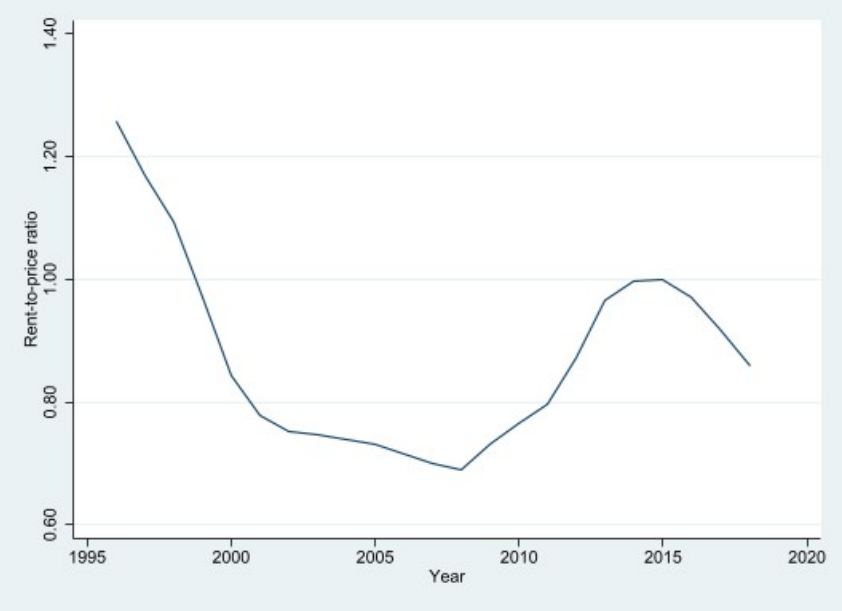

Figure 2: Rent-to-price ratio from 1996 till 2018

4.2.3 Assumptions used to determine costs and taxes

Common costs as an owner-occupier of a real estate property involve maintenance, local taxes, and insurance costs. Being a buy-to-let investor of real estate involves additional costs. Ideally, the property is occupied for the entire year. However, it may occur that the current tenant moves out and you should search for a new tenant. The time that the property is not rented out, and you as an investor do not receive rent, are called vacancy costs (ING Bank, 2021). In addition, it is often the case that a property manager is engaged who maintains the tenant relation and the property and searches for new tenants. These additional costs should also be taken into account when determining the costs for the invested property. An example of how these costs are built up is shown by (Demers & Eisfeldt, 2021). Components such as insurance costs, repairs, a property manager, credit loss, and vacancy costs are important to take into account when calculating non-tax costs. In practice, it is likely that different property owners have different approaches to allowing their property to degrade and undertaking regular repairs and maintenance. This will lead to variability in price appreciation and costs across properties. As a result, the estimates of the variability of housing returns are likely to be somewhat higher or lower than they are in actuality (Melser & Hill, 2018)

The limitation of the sample data set is that other than information on costs of local taxes and ground lease, no-cost information is provided. Many cities in the Netherlands have a ground lease system. 'The municipality charges a fee for the use of the land (Gemeente Amsterdam, 2021).' Local taxes involve property tax, water authority tax, and sewerage charge. Not every real estate transaction has information about local taxes and ground leases. However, there are enough data points to estimate the average tax costs and average ground lease costs. On 1202 observations local tax costs are on average

11,7% of property rental value and 578 observations on ground lease give an average of 3,7% of rental value. Another limitation of the sample is that I do not know if every property has a ground lease. Also, other non-tax costs are not available in the sample and should therefore be estimated on average costs in the rental sector. I will do this by comparing three papers that estimated these costs. This average should include maintenance costs (improvements and repairs), management costs, insurance costs, taxes, and vacancy costs. (Chambers, Spaenjers, & Steiner, 2019) provide a cost average of 36,7% of the rental value. They also mention that in many years the percentage ranges between 30 and 40 per cent. (Eichholtz, Korevaar, Lindenthal, & Tallec, 2020) apply a fixed cost fraction of 30% excluding vacancies and taxes and a total cost fraction of 40% including vacancies and taxes. They mention that comparable studies show 30-35% non-tax costs of rental value. Finally, (Demers & Eisfeldt, 2021) see an average of 40% expenses of gross yields. Therefore, in all yield calculations, a total cost of ownership factor of 40% has been applied.

4.3 Descriptive statistics on aggregate long-term return and yield series

Figure 3 and Table 4 show the outcomes of the calculations of total return. Figure 3 shows the mean return over time from 1980 till 2018. The return data shows large variations. If we compare Figure 3 to Figure 1 there is a large difference between the two figures. The difference is adding capital gain to net yield.

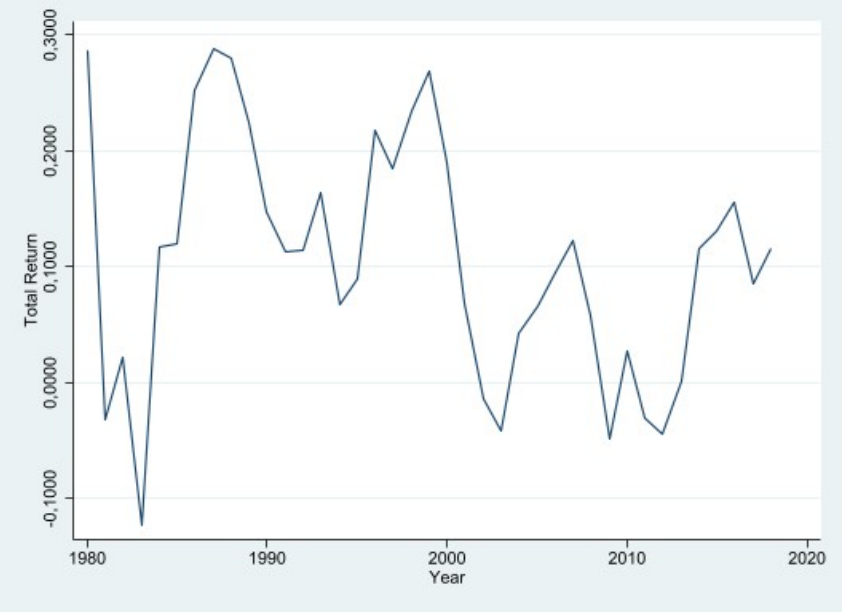

Figure 3: Average total return from 1980 till 2018

Table 4: Descriptive statistics Total Return from 1980 till 2018.

Year	Mean	Std. dev.	Median	Min	Max	Year	Mean	Std. dev.	Median	Min	Max	Year	Mean	Std. dev.	Median	Min	Max
1980	0,286	0,067	0,265	0,185	0,632	1993	0,164	0,029	0,164	0,090	0,213	2006	0,095	0,009	0,096	0,078	0,119
1981	-0,032	0,079	-0,062	-0,151	0,350	1994	0,068	0,025	0,069	0,023	0,136	2007	0,104	.	0,104	0,104	0,104
1982	0,021	0,050	0,020	-0,109	0,180	1995	0,089	0,021	0,087	0,067	0,215	2008	0,058	0,009	0,056	0,040	0,077
1983	-0,123	0,070	-0,123	-0,273	0,388	1996	0,217	0,016	0,217	0,164	0,257	2009	-0,074	.	-0,074	-0,074	-0,074
1984	0,118	0,090	0,109	-0,019	0,901	1997	0,185	0,015	0,186	0,155	0,214	2010	0,001	.	0,001	0,001	0,001
1985	0,120	0,078	0,116	-0,007	0,554	1998	0,235	0,014	0,236	0,190	0,278	2011	-0,058	.	-0,058	-0,058	-0,058
1986	0,252	0,056	0,244	0,135	0,435	1999	0,269	0,010	0,269	0,236	0,287	2012	-0,074	.	-0,074	-0,074	-0,074
1987	0,288	0,178	0,272	0,182	2,156	2000	0,191	0,011	0,192	0,159	0,216	2013	-0,002	0,010	-0,003	-0,016	0,019
1988	0,280	0,040	0,280	0,190	0,444	2001	0,069	0,010	0,070	0,047	0,092	2014	0,093	.	0,093	0,093	0,093
1989	0,225	0,108	0,218	0,129	1,628	2002	-0,014	0,011	-0,014	-0,047	0,006	2015	0,115	.	0,115	0,115	0,115
1990	0,147	0,036	0,143	0,063	0,258	2003	-0,042	0,014	-0,042	-0,075	-0,019	2016	0,156	0,007	0,155	0,147	0,174
1991	0,113	0,029	0,111	0,036	0,176	2004	0,042	0,011	0,042	0,024	0,064	2017	0,086	0,006	0,085	0,077	0,095
1992	0,114	0,043	0,115	0,040	0,251	2005	0,066	0,006	0,066	0,055	0,076	2018	0,116	0,012	0,112	0,104	0,156

Table 4 shows descriptive statistics of the total returns. Presented are the mean, standard deviation, median, minimum, and maximum. Notable are the high standard deviations in the 1980s. This suggests that there is a large difference in returns among real estate investors in that period. Ranging from 4% to 17,8% in standard deviation. The standard deviation in the rest of the period is low and therefore the returns look the same among investors. Important to show are the Gross yields. These yields are rental returns excluding capital gain and costs of the property. Table 5 shows the descriptive statistics of Gross yields from 1980 till 2018. We notice a different pattern in statistics related to the total returns. The capital gain changes the total return for a year a lot. A positive yield could become negative and a

negative yield could become positive through capital gain. The next section explains political factors and decisions over time at the housing market. An explanation could be that the returns are affected by these political factors.

Table 5: Descriptive statistics Gross Yields from 1980 till 2018.

Year	Mean	Std. dev.	Median	Min	Max	Year	Mean	Std. dev.	Median	Min	Max	Year	Mean	Std. dev.	Median	Min	Max
1980	0,193	0,111	0,158	0,025	0,770	1993	0,137	0,048	0,137	0,014	0,219	2006	0,032	0,015	0,034	0,003	0,072
1981	0,252	0,132	0,203	0,055	0,890	1994	0,126	0,041	0,127	0,051	0,239	2007	.	.	.	.	.
1982	0,236	0,083	0,233	0,020	0,500	1995	0,105	0,035	0,101	0,068	0,315	2008	0,040	0,015	0,035	0,010	0,071
1983	0,288	0,117	0,289	0,038	1,140	1996	0,096	0,027	0,094	0,007	0,161	2009	.	.	.	.	.
1984	0,286	0,150	0,271	0,058	1,591	1997	0,077	0,026	0,080	0,027	0,126	2010	.	.	.	.	.
1985	0,273	0,130	0,267	0,062	0,997	1998	0,080	0,024	0,081	0,005	0,151	2011	.	.	.	.	.
1986	0,222	0,093	0,210	0,027	0,527	1999	0,071	0,017	0,071	0,015	0,101	2012	.	.	.	.	.
1987	0,230	0,296	0,202	0,053	3,343	2000	0,064	0,019	0,067	0,011	0,106	2013	0,047	0,017	0,046	0,025	0,083
1988	0,202	0,066	0,201	0,051	0,475	2001	0,062	0,017	0,063	0,025	0,099	2014	.	.	.	.	.
1989	0,175	0,179	0,163	0,016	2,513	2002	0,060	0,018	0,060	0,005	0,093	2015	.	.	.	.	.
1990	0,169	0,061	0,162	0,029	0,354	2003	0,059	0,023	0,060	0,003	0,097	2016	0,024	0,012	0,023	0,009	0,054
1991	0,160	0,049	0,157	0,031	0,265	2004	0,054	0,019	0,055	0,025	0,091	2017	0,021	0,010	0,020	0,008	0,037
1992	0,156	0,071	0,157	0,032	0,384	2005	0,037	0,011	0,038	0,018	0,054	2018	0,032	0,020	0,025	0,012	0,097

4.4 Political factors

In the regression model, macroeconomic variables have been used. It is however known that National fiscal policies are important influencing factors for the housing market. According to (Boelhouwer, 2017), many scientists have observed that the Dutch government applies a generous taxation regime to homeownership. National policy has steered the Dutch housing market over several decades. For example, the owner-occupied sector has grown to be the largest sector in the housing market much later in the Netherlands than in many other countries, because for a long time the social rental sector that provided housing for large sections of the population prevented such a development (Haffner & Boumeester, 2010). The national government ensured that the housing sector was affordable and accessible for all households. The government desired low-cost housing, such that households have been expected to maintain a standard of living independent of their income. Social rental housing provision has not only contributed to this directly but also indirectly by dampening private demand and thus private rent prices (Van Duijne & Ronald, 2018).

At the end of the 1980s, national policy was to focus on expanding homeownership (Dol, 2008). The government published in 1989 a white paper called 'Housing in the 1990s' in which they made clear that the central government would gradually retreat from the housing market and leave more space for private developers and the market (Ministerie van VROM, 1989). One reason for this policy was to provide the average citizen to create more wealth in assets (Aalbers, Bosma, Fernandez, & Hochstenbach, 2018). This led to the so-called VINEX-locations. VINEX-locations are large-scale housing areas in several Dutch cities (van Kempen & Priemus, 2002). In these neighbourhoods, the percentage of social dwellings was a lot less than in other neighbourhoods and focused more on the owner-occupier. Urban policies do also play a role in providing homeownership. By expanding the total dwellings of a city by splitting houses into more houses (Aalbers, 2004).

In the mid-90s, more political decisions were made. The central government published a new white paper in 1997 called 'Nota Stedelijke Vernieuwing' (Ministerie van VROM, 1997). In order to prevent low-rent housing districts from becoming low-income areas, more expensive dwellings should be added for higher-income households. As a consequence, these districts will have more owner-occupied and expensive rental houses (van Kempen & Priemus, 2002). The classic housing associations were also privatized and given more freedom in the decisions they would make (Aalbers, Loon, & Fernandez, 2017). As a consequence, some housing associations took financial risks, which led to high debts. One of the biggest housing associations Vestia almost faced bankruptcy in 2012. They were forced to sell a lot of their portfolio to real estate investors because of financial mismanagement (Trappenburg, 2021). Another political decision that hurt housing associations is the *Verhuurderheffing* in 2013. This political tax measure was implemented to gain more income for the national government in order to fill up its national funding gap. However, housing associations had to deal with more costs and may be forced to sell a part of their assets to real estate investors or owner-occupiers (Boelhouwer et al., 2014). This tax measure was only applicable to those who rented out more than 50 social housing. So, this tax measure did not have an effect on most private real estate investors.

A political subsidy that has been present for more than a century is the *Hypotheekrenteaftrek*. Intro-

duced in 1914, it is another measure from the Dutch government to support homeownership (Lejour, 2016). However, in the late nineties, this measure had lost its initial purpose and nowadays it cost the government almost 14 billion euros per year. Since 1997 the government has taken several measures to reduce the advantage for homeowners and in 2013 it decided to reduce the *Hypotheekrenteaftrek* (Lennartz, Schilder, & van der Staak, 2019). For private investors, it has become a more attractive market over the last few years. For example, since October 2015 it is possible to use the home value to calculate the maximum rental price on social housing. As a consequence, rental prices could go up and if these prices go up substantially, these rental homes are not social housing anymore but private housing. There is no maximum amount of rent on private housing and this makes buy-to-let more attractive for real estate investors. Furthermore, since July 2016 private real estate investors could offer a shorter rental contract of two years. This weakens the security of tenure in housing contracts in favour of the investor (Aalbers, Bosma, Fernandez, & Hochstenbach, 2018).

Over decades, the declining yields seem not directly to be affected by political factors apart from the last ten years. The support of homeownership could have made renting properties unpopular. Furthermore, if more people would like to buy a house, the prices of properties could become more expensive because more people would like to buy a house. As a consequence, the rents did not rise evenly with the house prices and therefore the yields on properties became lower. Figure 4 shows the average sales price from 1980 till 2018. The Figure confirms the explanation of house prices. The huge decline is a limitation of the series because the data set does not contain the years 2007, 2009 till 2012, 2014, and 2015. Still, when the sales price is low, the yields are high, and vice versa. However, we could not conclude that the support of home-ownership is the cause of decreasing yields over time.

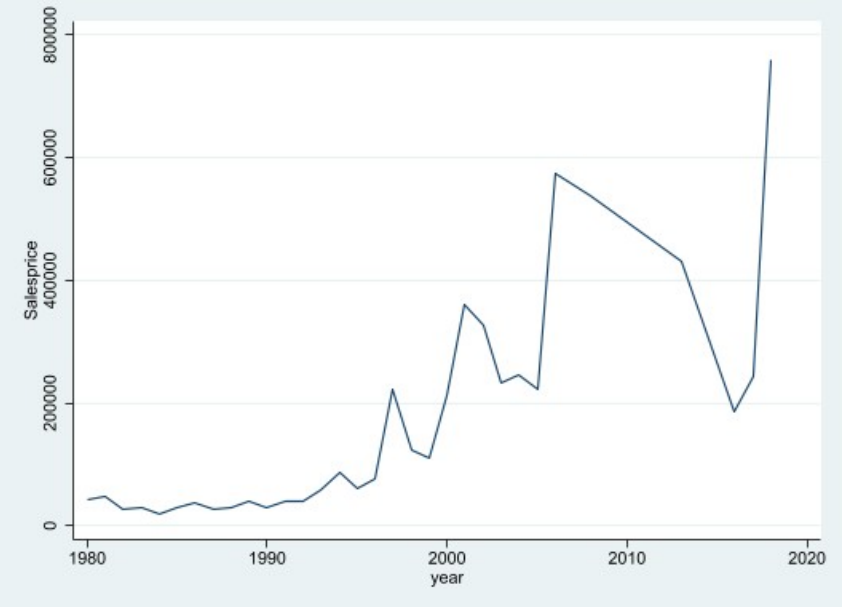

Figure 4: Average sales price from 1980 till 2018

4.5 Returns relative to the evolution of the percentage of private renting in Amsterdam

Figure 5 below shows the evolution of private renting and returns made on properties in Amsterdam from 1980 till 2018. From the year 1980, we notice a decline in the percentage of private renting in Amsterdam until 2013. The breaking point is 2012 when the decline stops. From 2013 onwards the percentage of private renting is rising again. Comparing this private renting percentage to the average yields we observe a declining percentage in yields too. However, the returns show a different pattern because of the capital gain. So far, we do not have evidence that investors stepped out of rental housing because total returns were structurally declining. Returns seem to fluctuate over time and do not relate to private rent percentage. However, the yields are declining the same way as private rent. This could be evidence that investors stepped out for a long time because the yields on properties where disappointing.

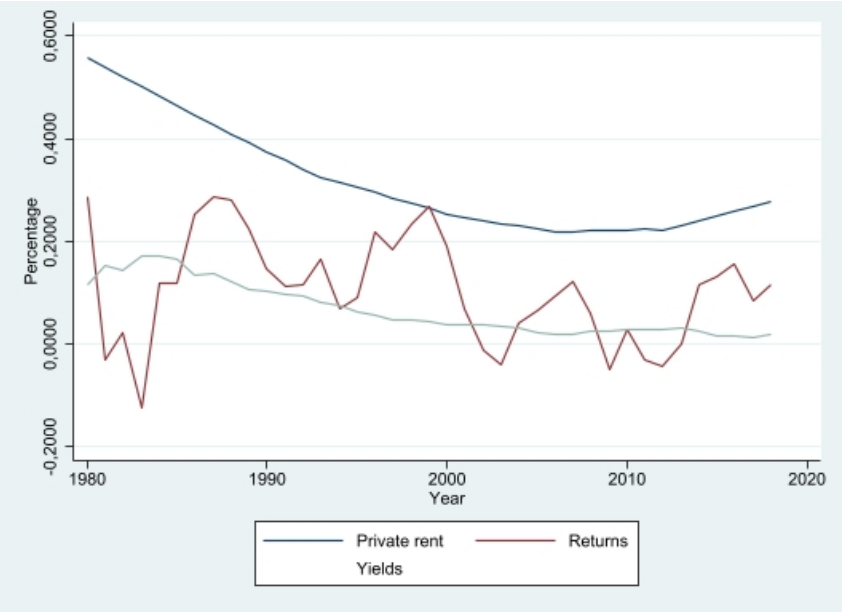

Figure 5: Percentage private renting, returns, and yields from 1980 till 2018

5 Determinants of the percentage of private investors in residential real estate

5.1 Description of regression model

In the analytical model, the test variable is the change percentage of private rent. Assuming that landlords are influenced by macroeconomic variables, it can be expected that as these numbers and percentages change, the change in the percentage of private rent will be influenced. The general model that has been constructed to test the hypotheses is constructed as follows:

$$\Pr ivate\, rent = \alpha 0 + \alpha 1 Total\, return + \alpha 2 Stock\, return_{it} + \alpha 3 Mortgage\, rate_{it} + \alpha 4 Population_{it} + \alpha 5 \Pr operties_{it} + \alpha 6 Households_{it} + \alpha 7 Government\, bond_{it} + \alpha 8 Year_{it} + \epsilon_{it}$$

In each of the regressions, the general model will be adjusted to the particular hypothesis to be tested. More details on this approach will follow below. Table 9 in the Appendix shows the correlations among the private rent-related variables. Private rent is positively correlated with Population. On the contrary, Private rent is negatively correlated with every other variable. Private rent is for example highly negatively correlated with Mortgage rate and Government bond. However, we should remember that correlation is not resistant, so outliers can change the value of the outcome (Moore, McCabe, Alwan, Craig, & Duckworth, 2016).

After producing the descriptive statistics and the correlation table in the previous section, the testing process of the different hypotheses will be explained. First of all, I make use of Time-series data. Which is data collected for a single entity at multiple points in time (Stock & Watson, 2015). In this paper, the single entities are the returns on the Amsterdam housing market and the percentage of private real estate investors in Amsterdam. One of the main problems that could occur with time-series data is nonstationary. The main consequence of non-stationarity we could face is Spurious regression. We might find common trends instead of common deviations from trend. These trends in time series data can be detected by several methods. A well known and reliable method is the Dickey-Fuller test. The Augmented Dickey-Fuller test has been executed on every variable in the regression model. To reduce the nonstationary, the variables Population, Government bond, and Unemployment rate have been lagged by one lag. The outcome of the Dickey-Fuller test shows that adding one lag to these variables removed the non-stationary. Another solution to unit root besides adding lags is to take the first differences of variables. For the variables Mortgage rate and Net yield, the first difference has been used. Log-differencing is not a solution to every variable. The reason is that a lot of variables already have a change percentage. Log-differencing would therefore be a problem because you take the difference of a differenced variable. For the variable Private rent nonstationary will be removed by adding Year to the regression as a trend term. As already mentioned, one of the limitations of the series is that we have missing years in the dataset (gaps). To replace these gaps, using the last available observation produced more powerful unit root tests (Ryan & Giles, 1998). Therefore, I have filled up these gaps in the data.

The first hypothesis will test macroeconomic effects and predicts that the yields and returns will be

negatively influenced by alternative investments Stocks and Government bonds. Furthermore, they will be negatively influenced by mortgage rate, unemployment, and properties. Return and yields will be positively influenced by the rise in population and households. The dependent variables will be first tested on every variable. Following the paper by (Gilbert, 1986) where he concludes that a model under the specific-to-general approach could be sub-optimal in the sense that the general-to-specific approach represents the data better. Therefore, I start with the biggest possible model and specify the model further by performing tests with fewer variables.

At the second hypothesis, the variable Private rent will be negatively influenced by alternative investments stocks and government bonds and also negatively influenced by mortgage rate, unemployment, and properties. Private rent will be positively influenced by population, real estate returns, and households. These are all macroeconomic factors that could influence the decision to invest in real estate. Similar to the previous hypothesis, the general-to-specific approach is also applied to this hypothesis. In the next section, I present the results of these tests of hypothesis.

6 Outcomes of tested hypotheses

Table 6 presents the regression results for hypothesis 1. The dependent variable is Net Yield. At the first test, all variables have been included. The test presents p-values above the five per cent level for all variables. Therefore, we do not see any significant influence of a variable on Net Yield. On the ten per cent level, Population (-0,420) and Unemployment rate (-0,294) are significant. Where both variables have a negative influence on the change of Net Yield. Other variables do not come close to significance in explaining a change in Net Yield at the first test. At the second test, the variable Government bond has been removed from the regression. Some coefficients and p-values have changed, but we do not see large differences compared to the first test. However, Unemployment rate has become significant at the five per cent level. The significance proves are estimation that unemployment has a negative influence (-0,299) on net yield. At the third test, the variable Households has been removed from the test. We find significance at the five per cent level for Population (-0,433), but not anymore for Unemployment rate. The significance of Population and the corresponding coefficient contradict our estimation. In our estimation, more people implies more demand and therefore higher rents and prices. Which should inevitably lead to higher returns. However, this is not the case in the regression. At the final test, the variable Stock return has been removed and Population is still significant. Unemployment rate has become significant again and also the intercept is significant at the five per cent level. A possible explanation for a lot of variables not showing significance is the R-squared. The R-squared started already at a low rate of 0,344 and ended at 0,264. This could mean that the model is not providing a good fit to the data. In general, we could not establish hypothesis 1 fully according to the results of these tests.

Table 6: First regression results for hypothesis 1. Net yield will be tested on several macroeconomic factors. Included are the coefficient, standard error, and the p-value. The first test includes all variables. At the other tests more variables have been excluded from the regression. Finally, the R-squared for the representativeness of the data and total observations is included for every test.

Variable	1st test			2nd test			3rd test			4th test		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Intercept	0,015	0,009	0,117	0,011	0,009	0,196	0,014	0,008	0,092	0,018	0,008	0,028
Mortgage rate	0,450	0,304	0,149	0,442	0,305	0,157	0,456	0,306	0,146	0,454	0,307	0,149
Population	-0,420	0,244	0,096	-0,312	0,223	0,173	-0,433	0,198	0,036	-0,436	0,198	0,035
Properties	0,162	0,263	0,542	0,240	0,254	0,353	0,286	0,252	0,266	0,317	0,251	0,216
Unemployment rate	-0,294	0,145	0,052	-0,299	0,146	0,049	-0,270	0,144	0,070	-0,345	0,127	0,010
Stock return	-0,011	0,010	0,295	-0,010	0,010	0,327	-0,011	0,010	0,289			
Households	0,683	0,432	0,124	0,373	0,327	0,262						
Government bond	-0,110	0,101	0,284									
Observations	38			38			38			38		
R-squared	0,344			0,318			0,289			0,264		

Table 7 presents the second regression results for hypothesis 1. The dependent variable is Total return. The procedure for these regressions are same but the independent variables are tested on a different dependent variable. The difference between the variables Net Yield and Total return is that capital gain has been added to net yield to get the total return. Looking at the results of the regression from

the first test, significance is found at Unemployment rate at a positive coefficient (3,280). The other variables do not show significance at the five per cent level. However, at the fourth and final test, we see some significance at the intercept. This is at the ten per cent level of significance. The intercept has a negative coefficient of -0,119 and Unemployment rate has a positive coefficient of 4,064. Remarkable is the negative coefficient for Unemployment rate with Net yield as the dependent variable and a positive coefficient for Unemployment rate when Total return is the dependent variable. Therefore, adding the capital gains seemed important to change the coefficient from negative to positive. Looking at the R-squared from 0,337 at the first test and 0,281 at the fourth test, we still do not have a good fit for the data.

Table 7: Second regression results for hypothesis 1. Total return will be tested on several macroeconomic factors. Included are the coefficient, standard error, and the p-value. The first test includes all variables. At the other tests more variables have been excluded from the regression. Finally, the R-squared for the representativeness of the data and total observations is included for every test.

Variable	1st test			2nd test			3rd test			4th test		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Intercept	-0,085	0,084	0,318	-0,068	0,078	0,388	-0,081	0,074	0,281	-0,119	0,069	0,095
Mortgage rate	2,692	2,814	0,346	2,732	2,784	0,334	2,674	2,751	0,338	2,700	2,791	0,340
Population	2,165	2,257	0,345	1,617	2,041	0,434	2,129	1,776	0,239	2,165	1,802	0,238
Properties	-1,436	2,436	0,560	-1,829	2,321	0,437	-2,023	2,266	0,379	-2,385	2,284	0,304
Unemployment rate	3,280	1,345	0,021	3,305	1,330	0,019	3,184	1,295	0,020	4,064	1,151	0,001
Stock return	0,131	0,096	0,181	0,127	0,094	0,187	0,131	0,093	0,169			
Households	-3,148	4,000	0,437	-1,577	2,983	0,601						
Government bond	0,560	0,937	0,555									
Observations	38			38			38			38		
R-squared	0,337			0,329			0,323			0,281		

The conclusion of the first regression analysis as per hypothesis one, is that significant are few. Almost every variable did not show significance at the five per cent level. Some variables did show significant correlation at the ten per cent level. Variables Unemployment rate and Population proved significance and are negatively correlated with Net Yield. The negative coefficient of Unemployment rate on Net yield can be explained. Logically, more unemployment indicates fewer people with income and as a result not able to afford high rents. As a consequence, real estate investors are not able to rent out their property or rent out for the desired price. Eventually, this lowers the returns on real estate. On the other hand, unemployment is positively related to total return. The capital gain or loss could be making the change in the coefficient. A possible explanation is that total returns could be negative. Unemployment rate might be positively related to negative returns. We cannot draw conclusions from the other variables because significance levels are too high. The next section, will provide the regression results on the second hypothesis where the change in Private rent is the dependent variable.

In Table 8 the results of the regression for hypothesis 2 are shown. The dependent variable is Private rent. At the first test, all variables have been included. The intercept is significant at a p-value of 0,007 and a coefficient of -5,886. Furthermore, the variable Unemployment rate (0,815) is significant at a rate of 0,003. The other variables do not show any significance at the five per cent level. At the second test, the variable Government bond has been removed from the dataset and at the third test, the variable Households has been removed. However, we still do not see significance results. When we remove also the variable Stock return from the dataset, the variable Total return becomes significant at a p-value of 0,027. Private rent is negatively influenced by Total return, but not at a high coefficient (-0,064). This confirms our earlier suggestion that investors do not leave the real estate sector because of low returns. On the regression result, it seems a bit important but does not changes the percentage of private rent investors at a large rate. Unemployment rate is here significant and shows a positive coefficient at the fourth test of 0,734. This means that unemployment rate has a positive influence on the change in private rent percentage. Again, a possible explanation is that changes in private rent could be negative. Unemployment rate might be positively related to these negative changes in Private rent. It is however hard to establish the change in macroeconomic factors in a change in the percentage of Private rent and draw conclusions. Finally, if we look at the R-squared we find a rate from 0,829 on the first test to 0,799 on the fourth test. It seems that we do have a good fit for the data comparing the first 2 regression results. However, we can not conclude on most of the variables because they are not significant.

Table 8: Regression results for hypothesis 2. Private rent will be tested on several macroeconomic factors. Included are the coefficient, standard error, and the p-value. The first test includes all variables. At the other tests more variables have been excluded from the regression. Finally, the R-squared for the representativeness of the data and total observations is included for every test.

Variable	1st test			2nd test			3rd test			4th test		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Intercept	-5,886	2,018	0,007	-6,292	0,799	0,000	-5,307	0,595	0,000	-5,175	0,594	0,000
Total return	-0,042	0,033	0,209	-0,039	0,029	0,185	-0,054	0,028	0,065	-0,064	0,028	0,027
Mortgage rate	0,097	0,456	0,833	0,126	0,430	0,772	0,084	0,444	0,852	0,091	0,450	0,842
Population	-0,208	0,353	0,561	-0,208	0,347	0,554	-0,198	0,359	0,586	-0,138	0,361	0,705
Properties	-0,480	0,382	0,219	-0,489	0,373	0,200	-0,276	0,366	0,456	-0,231	0,369	0,536
Unemployment rate	0,815	0,245	0,003	0,836	0,223	0,001	0,845	0,230	0,001	0,734	0,218	0,002
Stock return	-0,022	0,015	0,162	-0,023	0,015	0,138	-0,020	0,015	0,192			
Households	1,111	0,636	0,091	1,109	0,625	0,087						
Government bond	-0,078	0,353	0,827									
Year	0,003	0,001	0,007	0,003	0,000	0,000	0,003	0,000	0,000	0,003	0,000	0,000
Observations	38			38			38			38		
R-squared	0,829			0,829			0,810			0,799		

7 Conclusions

Popular media in the Netherlands have been writing extensively about the housing market and the rise of private real estate investors. Private real estate investors are often mentioned as the cause of the national housing crisis. In this paper, the conditions that stimulate private investments into real estate have been discussed.

The question to answer was what it made attractive for private investors to invest in real estate. This question was examined by establishing the percentage of private real estate from 1980 until 2018 as the dependent variable and finding differences over time. Data was used from the auctioneer Eerste Amsterdamse where rents and sales prices of real estate have been collected from private real estate investors. With this data, rental yields over time were derived. Different variables were added to the model to find correlations to macroeconomic reasons to invest in residential real estate by private investors. In addition, an overview was composed of relevant political decisions for the period investigated. Two hypotheses were set up to answer the main question.

The first hypothesis tested the macroeconomic effects and stated that the yields and returns will be negatively influenced by alternative investments (Stocks and Government bonds). Furthermore, the hypothesis states a negative influence on the variables mortgage rate, unemployment, and properties. Return and yields are expected to be positively influenced by the rise in population and the number of households. The results of the analysis provided mainly insignificant results. It could not be concluded if the variables either positively or negatively influence the net yield or the returns. The variables Unemployment rate and Population showed significance and are negatively correlated with Net Yield. However the significance and negative coefficient of Population contradicted our estimation. In our estimation, more people implies more demand and therefore higher rents and prices. The negative coefficient of Unemployment rate Net yield supports our estimation. Unemployment is positively related to total return and this also contradicted the estimation. The capital gain or loss could be making the change in the coefficient. The second hypothesis states that the variable Private rent will be negatively influenced by alternative investments stocks and government bonds and also negatively influenced by mortgage rate, unemployment, and properties. Private rent will be positively influenced by population, real estate returns, and households. The results showed also at this hypothesis no significance for almost every variable. Unemployment rate and Total return were the only variables that showed significance. Private rent is negatively influenced by Total return and unemployment rate and this contradicted the hypothesis. Overall no conclusions can be drawn from the regression analysis.

In literature, some influence of macroeconomic factors has been established. With the data available for this paper it can only be concluded that the political/fiscal factors have a larger influence on private real estate investors and their returns. For further research, a more complete, equally spread over time and extensive dataset is required. The gaps in the available set led to small yearly sample sizes. Extending the dataset might improve the results. When building further on the current data set two areas would need more work. Firstly critical data on ground lease was missing. Where ground lease is applicable property prices and rents could differ from where it is not. A deeper investigation of the data set used at

the property level could address this problem. Finally, often a time surface area data was not provided. The accuracy of rental yield calculations will benefit from adding this data. Another solution would be using an existing rent-to-price homeowner index. However, further research has to find out if such an index could be used.

Appendix

Table 9: Correlation table among private rent-related variables and regression model from 1980 until 2018. Correlation takes the covariance and standardises it. Due to standardisation the correlation lies between minus 1 and plus 1.

Variable	Private rent	Total return	Stock return	Mortgage rate	Population	Housing stock	Households	Unemployment	Government bond	Year
Private rent	1,000									
Total return	-0,232	1,000								
Stock return	-0,137	0,387	1,000							
Mortgage rate	-0,692	0,108	0,029	1,000						
Population	0,442	0,145	-0,148	-0,573	1,000					
Housing stock	0,056	-0,076	0,064	-0,057	-0,038	1,000				
Households	-0,513	-0,111	0,107	0,604	-0,499	0,268	1,000			
Unemployment	-0,192	0,030	0,326	0,353	-0,355	0,276	0,489	1,000		
Government bond	-0,743	0,129	0,052	0,984	-0,633	-0,144	0,570	0,311	1,000	
Year	0,776	-0,279	-0,127	-0,936	0,630	0,083	-0,603	-0,451	-0,951	1,000

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