BANK ĊENTRALI TA' MALTA
EUROSISTEMA
CENTRAL BANK OF MALTA

The rental sector and the housing block in STREAM

Brian Micallef and Nathaniel Debono[1]

WP/03/2020

[1] Brian Micallef is the Manager of the Research Department and Nathaniel Debono is a Research Economist in the Research Department of the Central Bank of Malta. Helpful comments and suggestions by Mr Alexander Demarco, Dr Aaron G Grech, Mr Noel Rapa and Mr Ian Borg are gratefully acknowledged. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Central Bank of Malta. Any errors are the authors' own.

Corresponding author's email address: micallefb@centralbankmalta.org

Abstract

In recent years the housing market in Malta has been characterised by significant demand and supply developments reflecting strong economic and population growth. While the determinants of house prices in Malta have long been studied and documented, much less is known about private sector rents, partly due to the absence of official statistics on this sector. This paper uses information from the Estate Agency Rent Survey to construct a proxy for private sector rents in Malta. Using this index, a specification for private sector rents is specified using an error-correction modelling approach and added to the housing block in STREAM. Consistent with theoretical expectations, a one-to-one relationship between rents and house prices is confirmed in the long-run. Short-run dynamics are affected by past developments in rents, the foreign population, the number of tourist nights stayed in private accommodation and the housing stock per household. The housing block in STREAM is modified to accommodate for the inclusion of the rents equation, with the specifications for house prices and dwelling investment modelled following a stock-flow framework in line with Gatt et al. (2018). A simulation using STREAM illustrates the impact on the main macroeconomic variables following a hypothetical 10% increase in real housing investment.

JEL Classification: R21, R31, E37.

Keywords: Rents; House prices; Housing investment; Housing market; Malta.

Table of Contents

Executive Summary

In recent years the housing market in Malta has been characterised by significant demand and supply developments reflecting strong economic and population growth. In particular, the private rental market has been buoyed by a number of demand factors, while permits for residential investment have increased significantly, with the eventual increase in the supply of housing likely to lower the price pressures in the housing market. While the determinants of house prices in Malta have long been studied and documented (Demarco, 1995; Camilleri, 2001; Falzon et al., 2005; Gatt and Grech, 2016; Micallef, 2018; Gatt et al., 2018; Ellul et al., 2019), much less is known about private sector rents, partly due to the absence of official statistics on this sector.

The relationship between house prices and rents features prominently in the housing market literature. However, despite the theoretical expectation that house prices and rents are related in the long-run, the rental market is still not normally incorporated in traditional macro-econometric models, with many of such models focusing on house prices, rather than rents. This could be due to the fact that the rental market remains highly regulated, with rent controls still prevalent in a number of countries. The Maltese rental market is no exception, with its duality between pre- and post-1995 lease agreements.

Despite the growth of the private rental sector and its increasing role as a housing tenure for a segment of the population, data on this sector are still scarce. In the absence of an official rental price index, the Estate Agency Rent Survey is used to construct a proxy for price developments in the private rental market in Malta. This index is used as the dependent variable in an econometric specification for private sector rents using an error-correction modelling approach and added to the housing block in STREAM, the traditional macro-econometric model of the Central Bank of Malta. Consistent with theoretical expectations, a one-to-one relationship between rents and house prices is confirmed in the long-run. The low coefficient of the error-correction term suggests that any disequilibrium in the relationship between rents and house prices is corrected very slowly. In the short-run, past developments in rents, the foreign population and the number of tourist nights stayed in private accommodation are all found to positively affect rents while the stock of housing per household has a negative impact on rents. Furthermore, the housing block in STREAM is modified to accommodate for the inclusion of the rents equation, with the specifications for house prices and dwelling investment modelled following a stock-flow framework in line with Gatt et al. (2018). A model simulation for a hypothetical 10% increase in real housing investment is used to illustrate the transmission channel of this version of STREAM on the main macroeconomic variables.

1. Introduction

In recent years the housing market in Malta has been characterised by significant demand and supply developments reflecting strong economic and population growth. In particular, the private rental market has been buoyed by a number of demand factors, while permits for residential investment have increased significantly, with the eventual increase in the supply of housing eventually intended to lower the price pressures in the housing market. While the determinants of house prices in Malta have long been studied and documented (Demarco, 1995; Camilleri, 2001; Falzon et al., 2005; Gatt and Grech, 2016; Micallef, 2018; Gatt et al., 2018; Ellul et al., 2019), much less is known about private sector rents, partly due to the absence of official statistics on this sector.

The relationship between house prices and rents features prominently in the housing market literature. The rent-to-price ratio is grounded in asset-pricing theory that is commonly applied for stock returns. From this perspective, households compare the long-term return of each tenure choice — renting or ownership — before reaching a decision and that any opportunity for arbitrage will eventually be eliminated, bringing house prices back to equilibrium. Present value models imply that theoretically (and in perfectly competitive markets), the valuation of a house should be equal to the present value of all future rent payments by tenants. This implies that rents and house prices should move in line with each other in the long-run. Other studies argue that in deciding whether to buy or rent a house, the rent payable should be compared to the costs incurred to own a house, known as the user cost of homeownership. If the cost of running the house remains constant, the housing market remains in equilibrium only if any changes in house prices are matched by changes in rents. In view of this expected long-term relationship, the house price-to-rent ratio is commonly considered to be a measure of housing price valuation. Despite the theoretical expectation that house prices and rents are related in the long-run, the rental market is still not normally incorporated in traditional macro-econometric models, with many of such models focusing on house prices, rather than rents. This could be due to the fact that the rental market remains highly regulated, with rent controls still prevalent in a number of countries. The Maltese rental market is no exception, with its duality between pre- and post-1995 lease agreements.

Private sector rents have been affected by a number of developments that took place after the country joined the EU. In particular, the large influx of foreign workers and the increasing share of tourists staying in private accommodation have generated an increased demand for rental accommodation. Rental accommodation is also affected by socio-demographic changes while demand for properties was buoyed by a low interest rate environment that encouraged portfolio rebalancing. Supply has responded, albeit sluggishly at first, to this increase in demand, with a sharp increase in the number of permits issued and in housing investment. The increase in housing supply was intended to meet the rise in demand, thereby easing price pressures in the housing market.

Despite the growth of the private rental sector and its increasing role as a housing tenure for a segment of the population, data on this sector are still scarce. In the absence of an official rental price index, this paper uses the Estate Agency Rent Survey (EARS) to construct a proxy for price developments in the private rental market in Malta. Reflecting these developments, a specification for private sector rents is specified using an error-correction modelling approach and added to the housing block in STREAM. Consistent with theoretical expectations, a one-to-one relationship between rents and house prices is confirmed in the long-run. The low coefficient of the error-correction term suggests that any disequilibrium in the relationship between rents and house prices is corrected very slowly. In the short-run, past developments in rents, the foreign population and the number of tourist nights stayed in private accommodation are all found to positively affect rents while the stock of housing per household has a negative impact on rents.

The housing block in STREAM is modified to accommodate for the inclusion of the rents equation, with the specifications for house prices and dwelling investment modelled following a stock-flow framework in line with Gatt et al. (2018). A model simulation is used to illustrate the impact on the main macroeconomic variables following a hypothetical 10% increase in real housing investment for one year. The simulation is intended to trace the transmission channel in STREAM in a variable that affects both the demand and supply-side, though at different time horizons. The increase in housing investment stimulates economic activity, which in turn exerts a small positive effect on house prices and rents in the short run. The supply impact, with housing investment eventually leading to more housing units and an increase in the housing stock, is only felt in the medium-to-long run. These results are sensitive to the time it takes for new permits to be included in the housing stock. As this transmission accelerates, the supply side effects offset the demand effects even in the short-to-medium run. With a longer transmission lag, the new supply takes longer to be available in the market, resulting in more pronounced demand effects in the short-to-medium term.

The rest of the paper is organized as follows. Section 2 provides a brief review of the relevant literature. Section 3 discusses the construction of an index for private sector rents using information from the annual EARS survey for Malta. Section 4 describes the empirical specification for private sector rents using an error-correction modelling approach. In this section we also discuss the adjustments required in the other equations of the housing block in STREAM. Section 5 documents the model simulation and the main transmission channels in STREAM. Section 6 concludes.

2. Literature review

The relationship between house prices and rents features prominently in the housing market literature. At its root is an element of substitutability stemming from the similarity of the service derived from renting and buying (Manganelli et al., 2014). Economic theory states that in equilibrium, house price

levels should be such that buyers are indifferent between renting and buying (Hargreaves, 2008). However, the decision between buying and renting may be swayed by other factors which make the commodity derived from purchasing a house different to that derived from renting. These considerations include the possibility of bequests (Rubio, 2018), consumer preferences and uncertainty about future rents and house prices (Smith and Smith, 2006). Furthermore, in addition to price considerations, tenure choice may be driven by homeownership's provision of a hedge against labour income risk (Davidoff, 2006) and against changes in future rent payments (Sinai and Souleles, 2005).

Present value models imply that theoretically (and in perfectly competitive markets), the valuation of a house should be equal to the present value of all future rent payments by tenants (Hendershott and Shilling, 1980; Poterba, 1984; Engsted and Pedersen, 2012; Howard and Liebersohn, 2019). This equilibrium condition, which draws parallels to the relationship between stock prices and dividends in the stock market, implies that rents and house prices should not differ significantly in the long-run. More precisely, growth in rent payments should match the growth in house prices (Green and Chang, 2005). Such a close relationship between the growth rates of house prices and rents has been shown to exist in the Maltese housing market by Gatt and Grech (2016), who in a study covering the period 2006-2015 found broadly similar changes in house prices and rents.

Other scholars argue that house prices may not necessarily be a good sole indicator of the cost of homeownership and other costs and benefits need to be considered (Diaz and Luengo-Prado, 2011). In this vein, the user cost method compares the rent payable by a tenant with the costs accrued to own a house, referenced in the literature as *ex ante user costs of homeownership* (Browne et al., 2013).

Hill and Syed (2016) and Fox and Tulip (2014), among others, express the relationship between rents and house prices implied by the user cost approach as follows:

$$R_t = u_t P_t$$

This equilibrium condition implies that individuals should be indifferent between renting and owning if the amount of rent to be paid, R_t is identical to the user cost of owning a house as a proportion of the price of the house, u_t, multiplied by the house price, P_t. The factors considered to shape the user cost of homeownership include interest costs, depreciation, costs incurred in relation to repairs, maintenance and insurance, buying and selling costs, property taxes, risks associated with buying and expected future price changes which may be positive or negative (Himmelberg et al., 2005; Gallin, 2008; Fox and Tulip, 2014).

Theoretically, the user cost equilibrium condition implies that rents and the user cost of homeownership should follow each other in the long-run (Krakstad and Oust, 2015). However, other

studies find evidence of long-term discrepancies between rents and user costs (Blackley and Follain, 1995; Garner and Verbrugge, 2007). These studies consider well-functioning housing markets, free of government intervention. This contrasts with the situation in Malta, where for a number of years, the functioning of the Maltese housing market was constrained by the rent controls imposed by government to control the rental market. While the rent reform in 1995 liberalised the post-1995 private rental market, leases which pre-date 1995 remain subject to rent controls.

The user cost equilibrium condition also implies that in equilibrium, the rent-price ratio should be equivalent to the user cost of homeownership and if the latter remains constant, housing market equilibrium is only maintained if any house price movements are matched by changes in rents. On the other hand, any discrepancy between the actual rent-price ratio and the rent-price ratio implied by the user cost equilibrium condition indicates disequilibrium in the housing market (Hill and Syed, 2016). Disequilibrium is corrected by pressures exerted by demand and supply forces on rents and house prices. If, say, house prices are abnormally high, renting becomes more attractive. The increase in demand for rental housing pushes rental prices up, leading to a higher rent-price ratio. A similar but converse argument applies in the case of higher-than-usual rents. This return to housing market equilibrium is evidenced by Ayuso and Restoy (2006) who attribute some of the house price appreciation observed in Spain, the United Kingdom and the United States in the nineties to an earlier period of house price undervaluation.

The house price-to-rent ratio is usually one of the indicators used in studies that apply a multiple indicator approach to assess misalignment in house prices (UBS, 2012; Schneider, 2013; Lenarčič and Damjanović, 2015). Micallef (2018) uses a similar approach with the house price-to-rent ratio being one of the indicators used to assess over or undervaluation of house prices in Malta, together with other measures that look at demand, supply and supply-wide factors.

The theoretically expected close relationship between house prices and rents has generated an interest in the ability of current house prices and rents to predict future price changes. Besides its use as an indicator of housing market valuation, the rent-price ratio (or house price-to-rent ratio) is also used by numerous studies which attempt to predict future changes in house prices and rents.

Despite its widespread use, evidence on the predictive ability of the house price-to-rent ratio is mixed. Mankiw and Weil (1988) find that the rent-price ratio cannot predict future house price movements while Hatzvi and Otto (2008) find no association between the rent-price ratio and future changes in rents. Engsted and Pedersen (2012) show that, while dependent on whether rents and house prices are measured in nominal or real terms, the ratio's ability to forecast returns is greater than its ability to predict future rents. Capozza and Seguin (1996) argue that a correct prediction of future price changes based on the rent-price ratio can only be made if quality differences between owner-occupied housing and rental houses are taken into account. The susceptibility of price-rent ratios to differences in

housing quality and characteristics was confirmed by later studies (Bracke, 2013; Clark and Lomax, 2020). Other studies, however, find that the rent-price ratio is a good indicator of future price changes (Clark, 1993; Hargreaves, 2008; Gallin, 2008; Krakstad and Oust, 2015). Using error-correction models and long-horizon regressions, Gallin (2008) finds that instances when house prices are high, relative to rents, are followed by periods characterised by weaker-than-usual house price growth and stronger-than-usual rent growth. Similar to the conclusion of Davis, Lehnert and Martin (2008), his results also show that the magnitude and significance level of the change in house price growth are such that the subsequent changes in house prices dominate changes in rents. In other words, the rent-price ratio is predominantly "corrected" via changes in house prices rather than changes in rents.[2]

Although theoretically a relationship between rents and house prices should exist, the rental market still does not usually feature in traditional macro-econometric models, with housing models generally focusing on house prices, rather than rents (DiPasquale and Wheaton, 1994; Olszewski et al., 2015; Gatt, Micallef and Rapa, 2018). This could be due to the fact that the rental market remains highly regulated, with rent controls still prevalent in a number of countries (Cuerpo et al., 2014). The Maltese rental market is no exception, featuring a duality between pre- and post-1995 lease agreements. Pre-1995 leases are still governed by strict rent controls, in some cases dating back to the 1930s, which over the years have led to the residualization of the rental market (Xerri, 2017, 2018). This process of residualization was further exacerbated by government policies that encouraged homeownership. While keeping the pre-1995 controls in place, the rent reform of 1995 introduced a highly liberal regime for post-1995 leases, which led to a dual rental market. Hence, the annual model of the Maltese housing market presented in Gatt et al. (2018), estimated over the period 1980 to 2017, excludes the private rental sector due to the absence of a competitive market in the first half of the sample. Furthermore, the long history of rent controls implies that official private sector rent indices in Malta have not been developed by the statistical authorities.

3. An index for private sector rents in Malta

At present there is no officially published rental price index in Malta. In its absence, information about the Maltese rental market can be derived from the annual Estate Agency Rent Survey (EARS). This survey, carried out annually among real estate agencies, is a collaborative effort between Eurostat, the International Service for Remunerations and Pensions (ISRP) at the OECD and the National Statistical Offices. This survey is intended to compare Brussels' cost of living with the cost of living of international civil servants in their place of employment.

[2] This finding could also depend on the length of the rental contract period. Rent contracts could be longer than one year and hence their adjustment would be more sluggish.

Around mid-year, the participating real estate agents are asked about the monthly rent (excluding charges and utilities) required for five types of dwelling, namely 1-bedroom flats, 2-bedroom flats, 3-bedroom flats, non-detached houses and detached houses. Data from the Estate Agency Rent Survey is available for all European Union Member States dating back to 2003. Table 1 presents the average monthly rent required for the five types of dwelling.[3]

Table 1: Average monthly rent in euro (€)

	1 bedroom flat (40-60m^2)	2 bedroom flat (80-100m^2)	3 bedroom flat (110-130m^2)	Non-detached house (110-130m^2)	Detached house (190-220m^2)
2003	300	470	630	885	1490
2004	330	470	610	885	1515
2005	330	455	580	885	1630
2006	300	510	700	960	1680
2007	350	540	790	1050	1700
2008	450	650	890	1300	2200
2009	460	640	820	1100	2200
2010	440	620	820	1130	2000
2011	450	640	880	1200	1800
2012	440	620	830	1080	1600
2013	460	640	900	1150	1700
2014	490	690	980	1350	2100
2015	610	800	1020	1350	2450
2016	680	950	1250	1500	2550
2017	760	990	1300	1700	2700
2018	820	1100	1400	1800	2700
2019	850	1100	1450	1850	2950

Source: Estate Agency Rent Survey

The figures and trends shown in Table 1 are only indicative of the developments in the rental market for a number of reasons. Firstly, estate agents are asked to consider only dwellings which are of good quality and situated in residential areas favoured by expatriates and professional people who pay rent themselves[4]. This makes it likely that the properties considered command higher rents than the national average (or median). In addition, no information about property characteristics is provided while the figures are also likely to conceal the considerable price heterogeneity that exists across

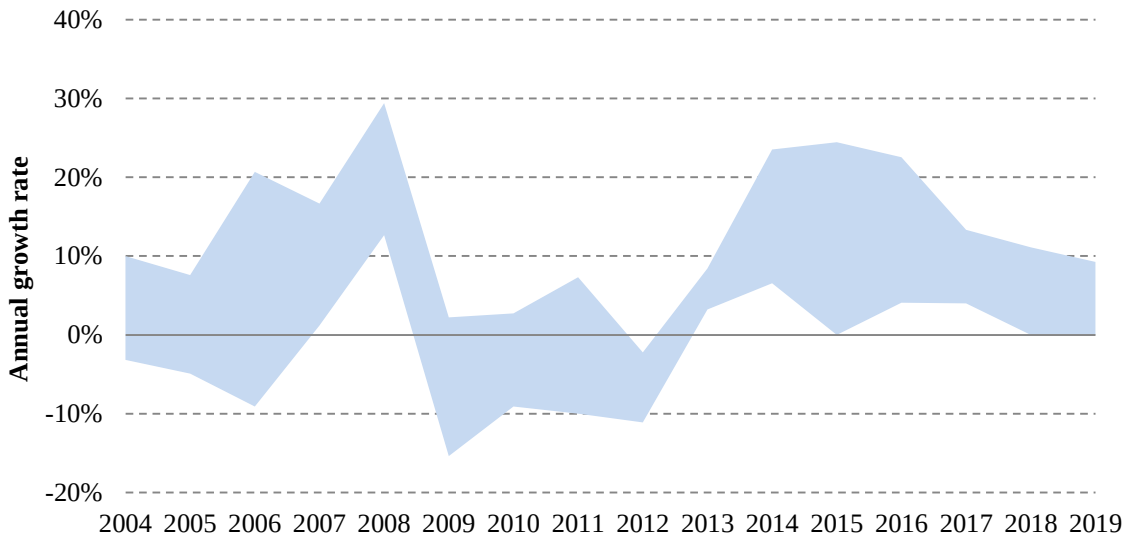
[3] The EARS provides the average monthly rent in local currency. As a result, the average monthly rent in Malta during the period 2003 – 2006 is outlined in the EARS in Maltese Lira. For consistency purposes, these figures are converted into Euro currency using the conversion rate: Lm1 = €2.33. Further details on the survey are available from: https://ec.europa.eu/eurostat/web/civil-servants-remuneration/estate-agency-rent-surveys

[4] The residential areas taken into consideration for Malta since 2017 are: Sliema, St. Julian's, Gzira, Msida, Ta' Xbiex, San Ġwann, Swieqi, Ibraġġ, Swatar, Valletta, Mellieħa, St. Paul's Bay, Xemxija, Qawra, Buġibba, Manikata, Bidnija, Wardija, Vittoriosa, Senglea, Cospicua, Marsaskala, Marsaxlokk, Birżebbuġa.

different localities in Malta. For instance, it is expected that properties in the central business district command a premium compared to similar rental units in the northern and southern part of Malta.

Using the average rent prices available from the EARS, Figure 1 shows the range of annual growth rates of Maltese rental prices for the five types of dwelling since 2004. Growth rates of the individual rental units shows two cycles. The first occurred in the aftermath of Malta's EU membership in 2004. This cycle peaked before the onset of the financial crisis, where in 2008, the annual growth rate of rental prices stood at double digit across all rental units. The financial crisis brought about a significant slowdown in the growth rate of private sector rents. The start of this period in 2009 coincided with the first and only decline during the sample period in the number of foreign workers since EU accession in 2004 (Grech, 2017).

Figure 1: Growth in Maltese Rental Prices



Source: Estate Agency Rent Survey, Authors' calculations

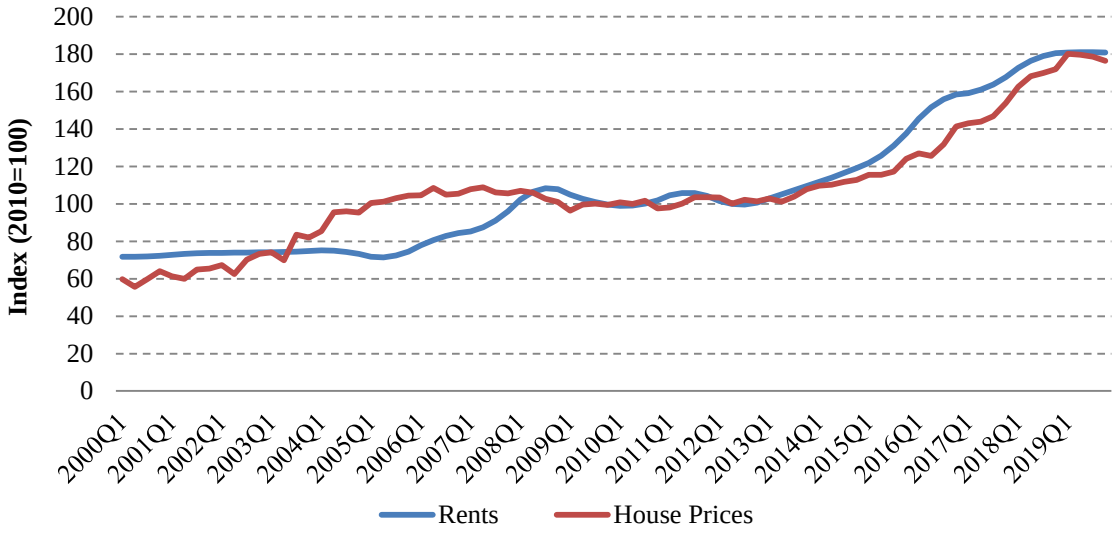
A second cycle of strong growth in rent prices commenced in 2013. In the period that followed, rental prices continued to increase, in some cases with a double-digit growth rate. More recently, rents seem to have decelerated somewhat although no price declines were registered until 2019.

In the absence of an official rental price index, the EARS is used to construct a rent index for Malta. Unfortunately, the lack of information about the number of properties available for rent by type of dwelling rules out the possibility of applying weighting to the different dwelling types. Consequently, only a simple average could be taken. Since we resort to a simple average, both detached and non-detached houses are excluded due to their high rental prices, relative to flats. As a result, a rental price index for Malta is established through a simple average of the monthly rent required for the three

types of flats. The index can be extended to years preceding 2003 using the HICP sub-component *CP041 – Actual rentals for housing*. The downside to the use of this subcomponent is that in the Maltese case, this is largely dominated by social housing (Micallef, 2016). However, due to the lack of other alternatives and given that the private rental market was relatively small before 2003, we resort to using the HICP index of actual rents inflation to extend the rents index for Malta beyond 2003.

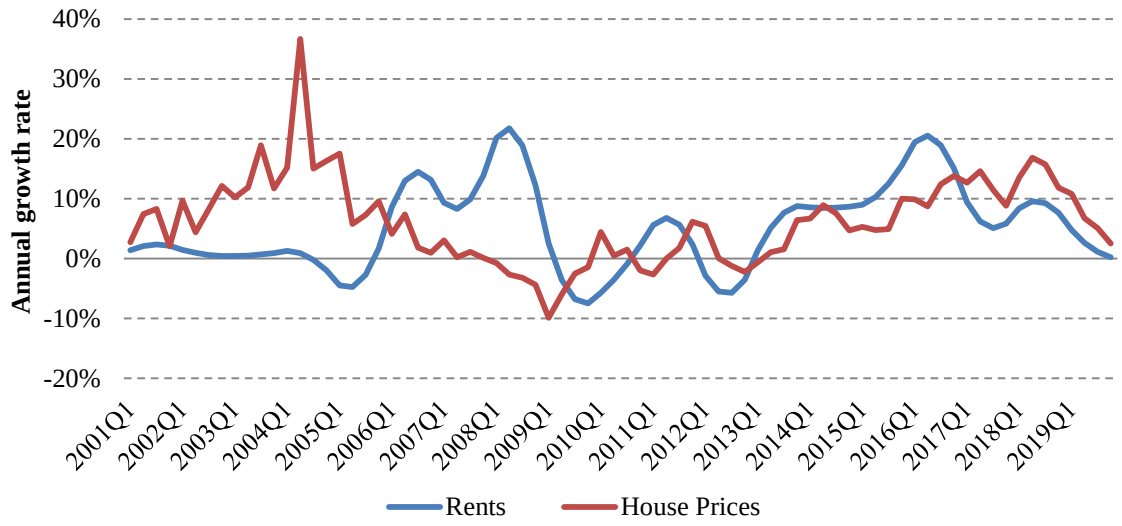
Figure 2 shows the development of house prices and apartment rental prices in Malta since 2000. Quarterly data on house prices is publicly available from the Central Bank of Malta database. On the other hand, the annual rent series is converted into quarterly frequency using the Chow-Lin technique. This is often used to transform low frequency data, such as annual data, into higher frequency data, such as quarterly data. This transformation is implemented in such a way that the average rent from the four quarters of a particular year matches the average rent for the whole year.

Figure 2: Development of Rents and House Prices in Malta



Source: Central Bank of Malta, Authors' calculations

Figure 3: Year-on-Year Growth rate in Rents and House Prices

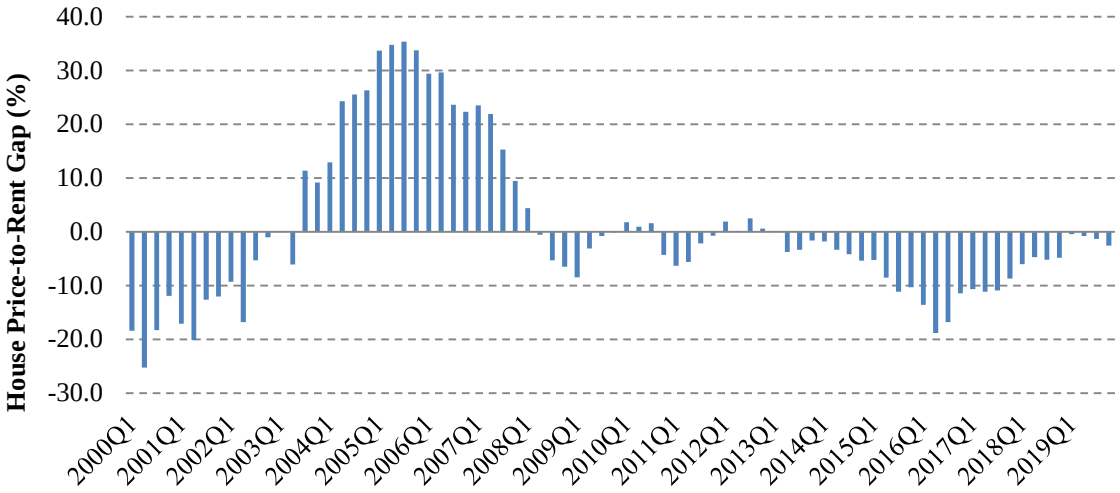


Source: Central Bank of Malta, Authors' calculations

The corresponding annual growth rates of rents and house prices are shown in Figure 3. In the period leading to EU accession, annual changes in rents were minimal but house prices experienced strong year-on-year growth. According to the CBM house price index, the annual growth rate of house prices peaked in mid-2004 before decelerating and eventually turning negative in 2008. In contrast, this period was characterised by rising rental prices for apartments, which increased sharply before declining in 2009. A period of volatile price changes followed, before house prices and rents started to rise again around 2013. Although no year-on-year declines have been recorded since, a deceleration in both house prices and rents has been observed in recent years.

Numerous studies in the housing market literature use the house price-to-rent ratio as a measure of housing market valuation. Figure 4 below shows the evolution of the gap between house prices and rents since the year 2000. The house price-to-rent gap is an indicator of the extent to which house prices are over/under valuated, relative to rents. In the early 2000s, rents were somewhat overvalued compared to house prices, perhaps reflecting the fact that private sector rents in the liberalized post-1995 market were set a relatively high level (BICC, 2000). However, the private rental sector during this period was relatively thin and not as developed as it is today. The strong increase in house prices that started in the pre-EU accession period led to a reversal in the house price-to-rent gap, with a period of house price overvaluation that peaked in 2005. In the period that followed, increases in rents coupled with the deceleration in house price growth narrowed the gap between house prices and rents considerably by 2008. Following some years during which no persistent deviations from equilibrium were observed, rents started to grow faster than house prices in 2014, which led the house price-to-rent ratio to turn negative, reaching a trough in 2016. This disequilibrium has been largely corrected since then such that by 2019, the ratio of house prices-to-rents was close to equilibrium.

Figure 4: House Price-to-Rent Gap



Source: Authors' calculations

The house price-to-rent ratio is commonly used as a valuation measure but it should not be used as a sole indicator of house price misalignment. For the latter, more indicators should be taken into consideration to reflect developments in demand, supply and system-wide factors, such as in the construction and banking sectors (Micallef, 2018). That said, the constructed house price-to-rent gap follows closely the misalignment indicator developed by Micallef (2018), especially up to 2017. The discrepancy in the most recent period reflects the fact that while house prices have moved broadly in line with rents, they have increased faster than other macroeconomic indicators such as consumer price inflation and wages.

4. Modelling private sector rents

In view of the theoretically-expected relationship between house prices and rents and the omission of the private rental sector from the annual model of the Maltese housing market presented in Gatt et al. (2018), we will now proceed to develop an empirical model for private sector rents. This model is specified in error-correction form and subsequently will be included in STREAM, the Central Bank of Malta's traditional macro-econometric model of the Maltese economy, together with some adjustments to its housing block, in line with the annual housing model developed in Gatt et al. (2018).

Developments in the private rental market have been affected by a number of factors in recent years. The sharp increase in the immigration of foreign workers, whose share in the workforce increased from less than 3% at the time of EU membership in 2004 to 23% in 2019, has led to an increase in the

demand for housing. The latter tends to be especially pronounced in the private rental market, given the reliance of foreign workers, especially newly arrived ones, on this sector for housing (Vargas Silva, 2017). In addition to net migration, changing patterns in the tourism industry, such as the increasing share of tourists staying in private accommodation, is also likely to increase the demand for rental housing. While the series used in EARS does not include accommodation for tourism purposes, such as short-lets, it is likely that the higher demand for these dwellings can have a spillover effect on private accommodation for long-lets. Finally, socio-demographic changes as well as a prolonged period of a low interest rate environment, which could have led to portfolio rebalancing by investors towards property, could also influence positively the demand for housing.

Figure 5 shows the preferred specification for private sector rents using an error-correction model and estimated over the period 2000Q1 - 2017Q4. Variables in levels (logs) refer to the long-run while those in first-differences (dlogs) refer to the short-run dynamics. Table 3 describes the explanatory variables together with the data sources used.

In the long-run, rents are assumed to move one-to-one with house prices, in line with the theoretical discussion in Section 1. This restriction was tested and confirmed using the Wald test since the null hypothesis that the two coefficients were statistically the same could not be rejected. The error correction term is statistically significant at the 5% level and its low coefficient suggests that any disequilibrium in the relationship between rents and house prices is corrected very slowly.

In the short-run, rents are affected positively by past developments in rents (capturing inertia in prices due, for instance, to multi-period contracts), the foreign population, tourist night stayed in private accommodation and developments in house prices, and negatively by the housing stock per household. Holding other things constant, a 1% increase in the foreign population raises rents by 0.16% in the short-run. As expected, the impact of tourism is less pronounced than that for the foreign population, reflecting that the series for rent prices captures mainly long-lets: ceteris paribus, a 1% increase in the share of tourists staying in private accommodation raises rents by 0.03%. On the contrary, an increase in the housing stock (per household) lowers rents by 0.22% with a lag of four quarters, holding the impact of other explanatory variables constant. Finally, we also include a short-term impact of house prices on rents, which we calibrate, that proxy broader trends in the housing market that spills over to the rental sector.

An analysis of the residuals in figure 5 indicates that these are I(0) and fluctuate around a mean of zero.

Econometric specification for private sector rents (t-stats in brackets):

ΔLOG(RENTS) = -0.003 + 1.30*ΔLOG(RENTS(-1)) - 0.57*ΔLOG(RENTS(-2))
(1.45) (12.0) (5.36)

+ 0.03*ΔLOG(@MOVAV(TOURISTS,4)) - 0.22*ΔLOG(HSTOCK(-4)/(POP(-4)/HHSIZE(-4)))
(1.85) (1.82)

+ 0.16*ΔLOG(POP_FOR(-4)) - 0.019*LOG(RENTS(-1)/PIH(-1)) + 0.1*ΔLOG(PIH(-1)) - 0.019*D03Q4
(2.38) (2.25) (2.43)

Sample: 2000Q1-2017Q4; R^2 = 0.87; **F-stat** = 54.8 (0.00); **DW**= 2.08

Figure 5: Residuals from the econometric specification of rents

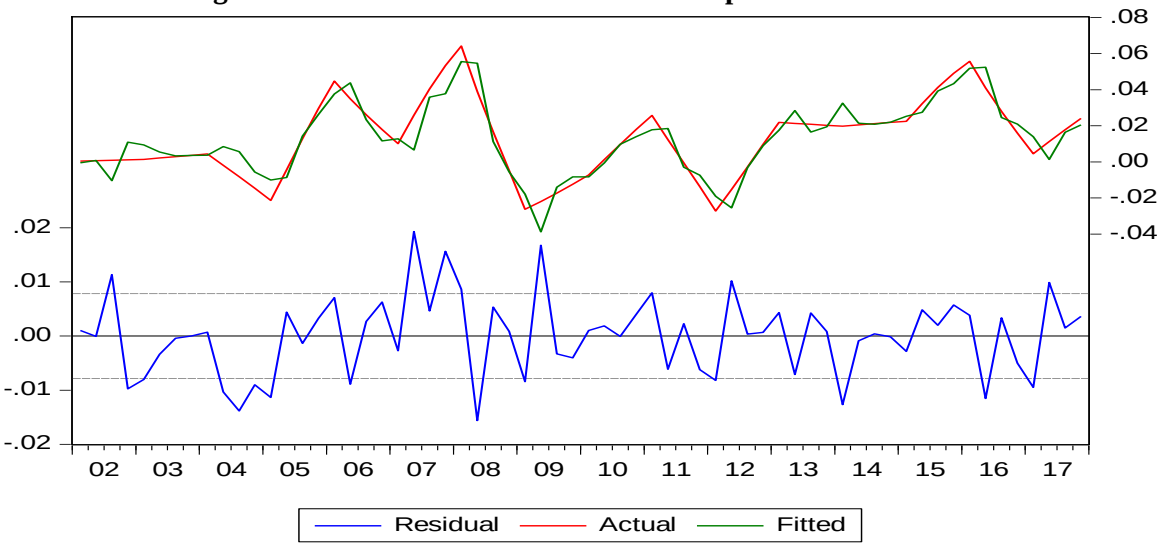


Table 2: Description of main variables used in housing block

Acronym	Description	Source	Units
RENTS	Private sector rent prices as described in Section 2	Own calculations	Index 2010=100
PIH	Advertised house prices	CBM	Index 2010=100
PIHF	Advertised house prices (in real terms)	CBM	Index 2010=100
TOURISTS	Tourist night stayed in private accommodation	NSO	Persons
POP_FOR	Foreign population in Malta	NSO	Persons
POP	Total population in Malta	NSO	Persons
HHSIZE	Average size of household	NSO	Persons
HSTOCK	Stock of housing	Own calculations	Housing units
PRIVGDPF	Private sector GDP (in real terms)	Own calculations	Millions of euro
YPDF	Disposable income (in real terms)	CBM estimates	Millions of euro
DWELLINGF	Housing investment (in real terms)	Eurostat	Millions of euro
PERMITS	Permits for new units	Planning Authority	Housing units
HCF	Mortgage credit to households (in real terms)	CBM	Millions of euro

This specification has been added to the housing block in STREAM. In terms of the explanatory variables, the share of foreign workers is exogenous (i.e. derived outside the model) while the share of tourists staying in private accommodation is assumed to move in line with non-SPE exports of goods and services. In addition, developments in rental prices are assumed to improve households' investment income, thereby adding another direct link between developments in the housing market and private consumption. According to the Survey on Income and Living Conditions (SILC), income from rental of property or land amounted to around 1.5% of average gross income for Maltese households in 2018, up from 1.0% in 2016. While this share is still relatively small, it is likely to increase further going forward, especially with the new legislation that entered into force on 1 January 2020, which was designed to regulate rental contracts and enforce their registration with the Housing Authority.[5]

In addition to these changes, the introduction of an equation for rents also necessitated some slight adjustments to the housing block in STREAM, which was brought in line with the annual housing econometric model described in Gatt et al (2018), which is based on a stock-flow framework.

House price equation (in real terms; t-stats in brackets):

ΔLOG(PIHF) = -1.93 + 0.36*ΔLOG(PIHF(-4)) + 0.90*ΔLOG(HCF) - 0.10*LOG(PIHF(-1)) +
(4.02) (3.91) (2.93) (3.48)

0.18*LOG(YPDF(-1)) - 0.15*LOG(HSTOCK(-1)/(POP(-1)/HHSIZE(-1))) + 0.11*D04Q2
(4.38) (3.45)

Sample: 2000Q1-2018Q4; $\boldsymbol{R^2}$ = 0.52; **F-stat** = 14.8 (0.00); **DW**= 2.42

In the long-run, house prices depend on disposable income and the housing stock per household. The elasticity of the latter has been calibrated at 1.5 – meaning a 1% increase in the stock of housing per household lowers real house prices by 1.5% in the long-run, holding other variables constant – in line with Gatt et al. (2018). In the short-run, house prices depend on their own past developments, reflecting a degree of persistence, as well as on real housing credit. Following Grech and Rapa (2016), interest rates were not included in this specification as their estimated elasticity was implausibly big. This could result from the prolonged low interest rate environment, which has persisted for half of the sample. However, given the endogeneity of interest rates in STREAM, a change in policy interest rates will still have an impact on house prices through the impact of monetary policy on credit and the labour market.

[5] The impact on consumption also depends on the distribution of such rental income. For instance, Ellul (2019) finds that the holdings of rental properties for short-lets tend to be relatively concentrated.

Housing investment equation (in real terms; t-stats in brackets):

ΔLOG(DWELLINGF) = -0.92 + 0.25*ΔLOG(DWELLINGF(-1)) + 2.23*ΔLOG(HCF(-3)) –
(2.50) (2.40) (2.79)

0.11*LOG(DWELLINGF(-1)/PRIVGDPF(-1)) + 0.12*LOG(PIHF(-1)) + 0.25*D03Q1
(3.57) (1.64) (3.29)

Sample: 2000Q1-2017Q4; $\boldsymbol{R^2}$ = 0.34; **F-stat** = 6.40 (0.00); **DW** = 2.01

In the long-run, real housing investment depends on private sector GDP and real house prices. In the short-run, housing investment depends on its own lags and on lagged real mortgage credit to households. This equation differs significantly from the specification in Grech and Rapa (2016), as the short-run dynamics in the latter relied on housing permits, both contemporaneously and with lags. On the contrary, in the current stock-flow framework, developments in housing investment will be tied to permits in an auxiliary equation so that the flows in dwelling investment are added to the housing stock. This channel was largely absent in Grech and Rapa (2016). Despite the absence of interest rates in this specification, changes in monetary policy affect dwelling investment indirectly through its impact on mortgage credit, private GDP and house prices.

Housing Stock

An auxiliary equation links housing investment to the number of permits issued for new units by the Planning Authority. This is necessary to transform dwelling investment, which are measured in monetary terms, to the number of permits, which in turn are used to construct an estimate of the stock of housing. According to the below specification, a 1% increase in real housing investment increases permits by 1.34% in the long-run.

ΔLOG(PERMITS) = -6.16 + 1.46*ΔLOG(DWELLINGF) - 0.80*LOG(PERMITS(-1))
(4.37) (5.16) (6.07)

+ 1.07*LOG(DWELLINGF(-1))
(5.34)

Sample: 2000Q1-2017Q4; $\boldsymbol{R^2}$ = 0.43; **F-stat** = 16.18 (0.00); **DW** = 1.94

A measure of the housing stock is constructed using an accumulation identity, as follows:

HSTOCK = (1 – δ)HSTOCK(-1) + PERMITS(-8)

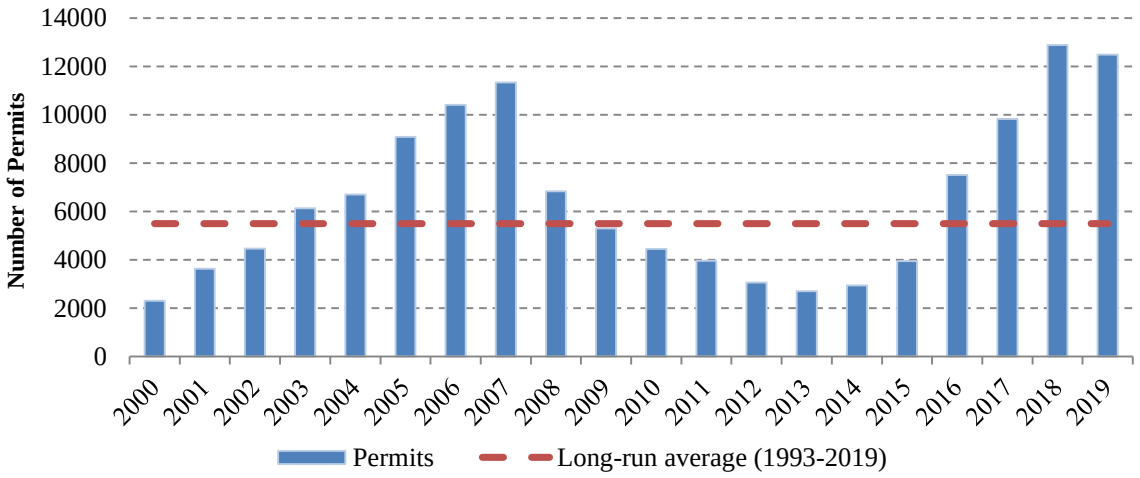
The accumulation identity states that the housing capital stock depends on the previous period's stock net of depreciation (δ) and augmented by new permits granted eight quarters' earlier. Implicit in this

identity is the assumption that newly issued permits take around two years to be developed into a housing unit. The depreciation is calibrated in order to ensure that the stock of housing in 1995, 2005 and 2011 is very similar to the figures published in the Census. From 2012 onwards, we use the approach adopted in Gatt et al. (2018) and use information on permits for net new units after controlling for any dwelling units that were destroyed in conversion or re-development projects.

5. Model simulations

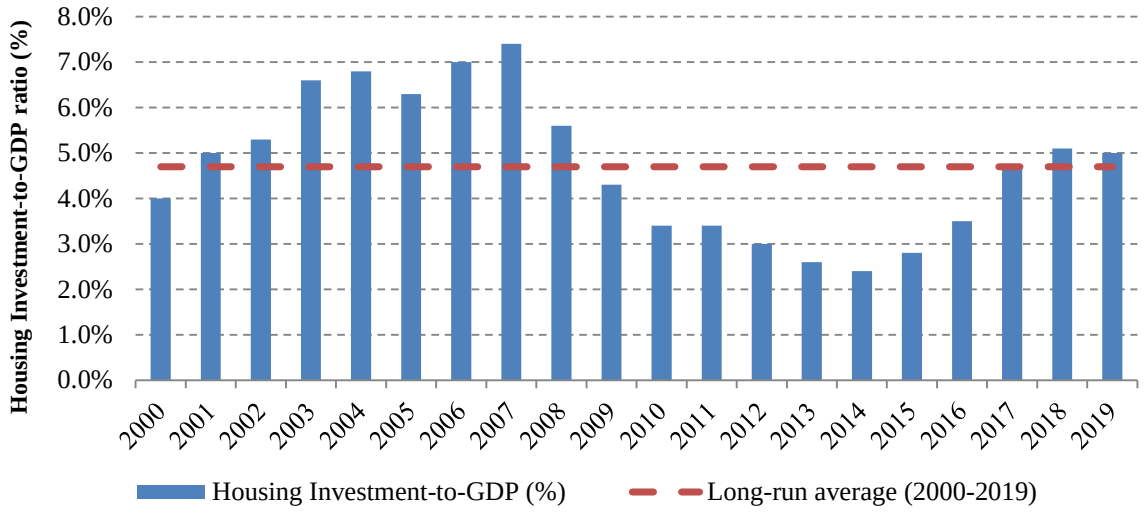
The amended housing block in STREAM is applied to assess the transmission from housing investment to the prices for housing and rents. Following the various factors outlined above that affected the demand for housing, permits for residential investment have increased significantly in recent years. According to Planning Authority statistics, the number of permits for new housing units issued in 2019 amounted to 12,485. The number of permits issued in 2018 and 2019 both exceeded the previous peak of 11,343 permits issued in 2007, and were almost five times higher than the amount of permits recorded in 2013, at the trough of the previous cycle, which stood at 2,705. As shown below, housing investment tends to be highly correlated with new permits.

Figure 6: Permits approved by the Planning Authority



Source: Planning Authority, Authors' calculations

Figure 7: Housing Investment-to-GDP ratio (%)



Source: Eurostat, Authors' calculations

Table 4 shows the impact on the main macroeconomic variables following a hypothetical 10% increase in real housing investment for one year. The simulation is intended to trace the transmission channel in STREAM in a variable that affects the demand side in the short-term and the supply side over the medium-to-long term. For comparison purposes, the last two columns also show the results of the same simulation using the previous version of STREAM, as documented in Grech and Rapa (2016) and updated in Borg et al. (2019). The results for the main macroeconomic variables between the two versions are broadly similar in the short term, reflecting the similar structure of the two models outside the housing block. More significant divergences for house prices kicks in over the medium-to-long term as the effects of housing supply on prices starts to be felt (see Figure 8). The latter effect was absent in Grech and Rapa (2016).

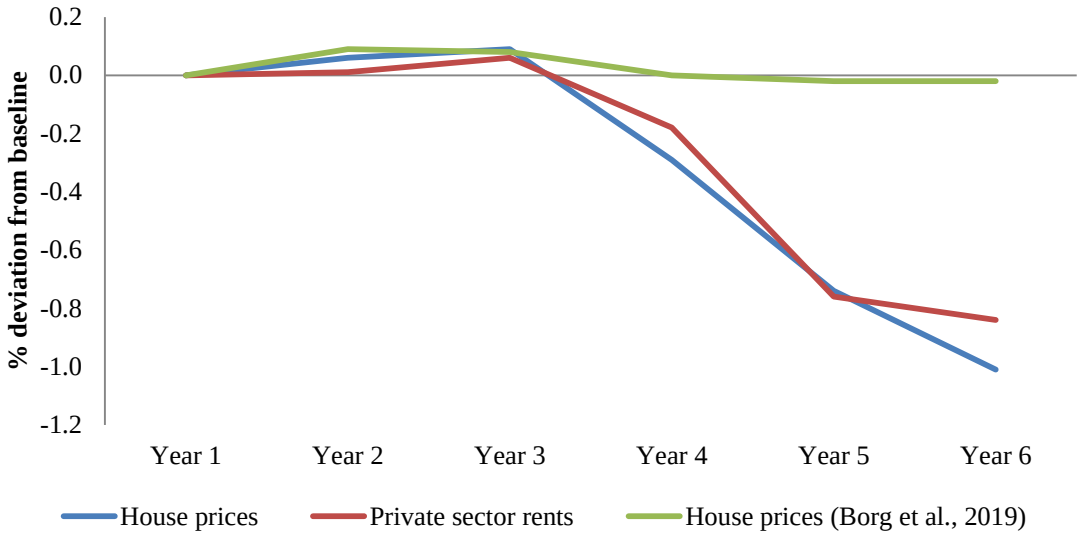
Table 4: Hypothetical scenario – 10% increase in Real Housing Investment

	Current version		Previous version *(Borg et al., 2019)*	
	Year 1	**Year 2**	**Year 1**	**Year 2**
ECONOMIC ACTIVITY				
Real GDP	0.07	0.10	0.08	0.07
Private consumption	0.01	0.06	0.01	0.07
Government consumption	0.02	0.07	0.03	0.06
Gross fixed capital formation	2.79	0.14	2.84	0.15
o/w Housing investment	10.00	0.00	10.00	0.00
Exports	0.00	-0.02	0.00	-0.05
Imports	0.61	-0.08	0.58	-0.09
PRICES				
HICP	0.00	0.01	0.00	0.01
GDP deflator	0.03	0.06	0.03	0.06
LABOUR MARKET				
Unemployment rate	0.00	-0.03	0.00	-0.02
Total employment	0.01	0.09	0.01	0.08
Real disposable income	0.02	0.10	0.02	0.09
HOUSE PRICES AND RENTS				
House prices	0.00	0.06	0.00	0.09
Private sector rents	0.00	0.01	N/A	N/A
CREDIT				
Real housing credit	0.00	0.03	0.00	0.04
Real consumer credit	0.00	0.04	0.00	0.05
Real NFC credit	0.00	0.07	0.04	0.16

In the short term, the increase in housing investment reflects a demand shock with an increase in economic activity and prices. The increase in real GDP in the first year is mainly driven by gross fixed capital formation but as it starts to affect the labour market, with an increase in employment and disposable income, it also starts to affect private consumption activity. Overall, GDP is expected to increase by 0.07% in the first year and 0.1% by the second year. The improvement in economic activity has a gradual, though modest, impact on prices. The latter explains the slight deterioration in exports of goods and services due to the modest deterioration in external price competitiveness, reflecting the fact that foreign demand and prices are assumed to remain unchanged. The increase in investment, which has high import content, leads to an increase in imports and a trade deficit. The improvement in economic activity and employment also has a positive impact on credit variables, though with a lag.

The increase in housing investment exerts a positive impact on house prices and rents in the short-to-medium run, reflecting the higher demand from the improvement in economic activity and the labour market. The supply impact, with housing investment eventually leading to more housing units and an increase in the housing stock, is only felt in the medium-to-long run. Figure 8 extends the simulation horizon for house prices and rents. Both of these prices register slight increases until the third year, with the impact from the increase in housing supply being felt from the 4th year onwards. The simulation shows that by the 6th year, house prices and rents will be around 0.8% - 1.0% lower from the initial 10% increase in real housing investment compared to the baseline scenario. By contrast, this supply-side channel was absent in the previous version of the model and, as a result, house prices remained broadly unresponsive in the medium-to-long run to the increase in dwelling investment.

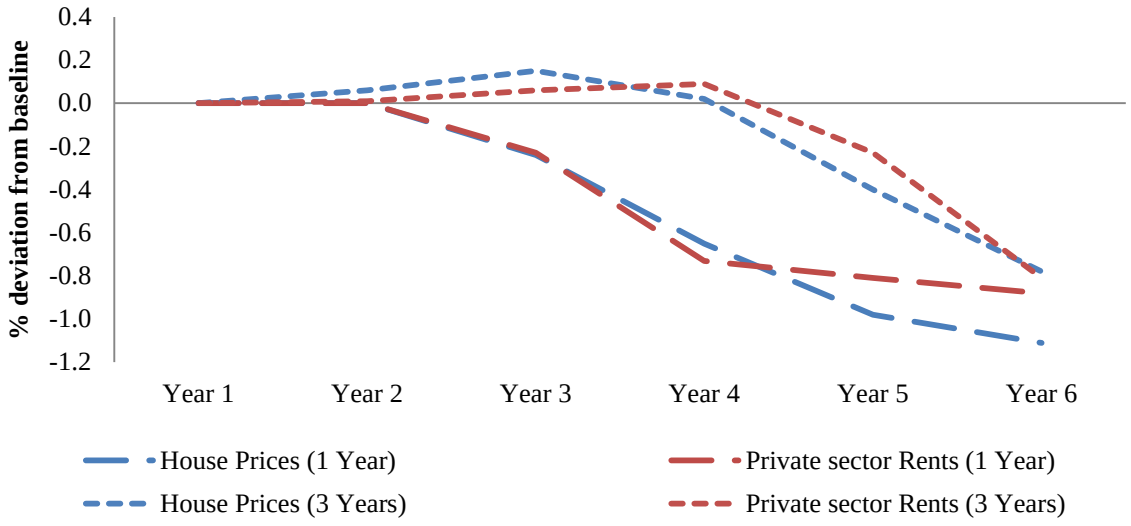
Figure 8: Simulated impact of housing investment on house prices and rents in STREAM



Source: Authors' calculations

As a robustness check, we also checked the sensitivity of the results to differences in the transmission assumption from the time the permit is issued by the Planning Authority to its inclusion in the housing stock. In the baseline scenario, we assumed that this process takes a period of 8 quarters (2 years). In Figure 9 below, we assess how the results change if we assume a shorter transmission lag of 4 quarters (1 year) and a longer one of 12 quarters (3 years). These changes affect the transitional dynamics, that is, the time it takes for the variables to reach their long-run values. As seen in Figure 9, in the scenario of a shorter transmission lag, the supply side effects tend to offset the demand effects even in the short-run. On the contrary, the demand effects tend to be more pronounced in the short-to-medium term with a longer transmission lag, as the new supply takes longer to be available in the market.

Figure 9: Sensitivity to different lags of transmission from permits to housing stock



Source: Authors' calculations

6. Conclusion

In recent years the housing market in Malta has been characterised by significant demand and supply developments reflecting strong economic and population growth. This paper has adjusted the housing block in STREAM, the traditional econometric model of the Central Bank of Malta, to reflect these changes in the housing market. In particular, the housing block in STREAM was modified to accommodate the inclusion of the rents equation, while the specifications for the modelling of house prices and dwelling investment followed a stock-flow framework in line with Gatt et al. (2018). A model simulation for a hypothetical 10% increase in real housing investment is used to illustrate the transmission channel of this version of STREAM on the main macroeconomic variables.

Going forward, further refinements in STREAM will focus on better integrating the supply side of the economy, particularly with regard to demographics and the labour market. Furthermore, additional information will continue to be gradually incorporated in STREAM as it becomes available, for instance, from the 2021 Census on population and housing. This will enrich the already high level of detail in STREAM such that the model remains a valid and reliable tool for forecasting and simulation purposes.

References

Ayuso, J. & Restoy, F. (2006), House prices and rents: an equilibrium asset pricing approach, *Journal of Empirical Finance*, *13*(3), pp. 371-388.

Blackley, D. & Follain, J. (1995), In search of empirical evidence that links rent and user cost, NBER Working Paper Series, No. 5177.

Bracke, P. (2015), House prices and rents: micro evidence from a matched dataset in Central London, *Real Estate Economics*, *43*(2), pp. 403-431.

Browne, F., Conefrey, T. & Kennedy, G. (2013), Understanding Irish house price movements - a user cost of capital approach, Central Bank of Ireland *Research Technical Paper*, No. 4.

Camilleri, D. (2011), A long-term analysis of housing affordability in Malta, *International Journal of Housing Markets and Analysis*, 4(1), pp. 31-57.

Capozza, D. & Seguin, P. (1996), Expectations, efficiency, and euphoria in the housing market, *Regional Science and Urban Economics*, *26*(3-4), pp. 369-386.

Clark, S. & Lomax, N. (2020), Rent/price ratio for English housing sub-markets using matched sales and rental data, *Area*, *52*(1), pp. 136-147.

Clark, T. (1993), Rents and prices of housing across areas of the U.S.: a cross-section examination of the present value model, IDEAS Working Paper Series 93/04.

Cuerpo, C., Pontuch, P. & Kalantaryan, S. (2014), Rental market regulation in the European Union, European Commission *Economic Papers* No 515.

Davis, M.A., Lehnert, A. & Martin, R.F. (2008), The rent-price ratio for the aggregate stock of owner-occupied housing, *Review of Income and Wealth*, *54*(2), pp. 279-284.

Davidoff, T. (2006), Labour income, housing prices, and homeownership, *Journal of Urban Economics*, *59*(2), pp. 209-235.

Demarco, A. (1995), Aspects of the housing market in Malta: 1980-1994, Central Bank of Malta *Quarterly Review*, December 1995.

Diaz, A. & Luengo-Prado, M. (2011), The user cost, home ownership and housing prices: Theory and evidence from the US, Article prepared for the *International Encyclopedia of Housing and Home* by Elsevier

DiPasquale, D. & Wheaton, W. (1994), Housing market dynamics and the future of housing prices, *Journal of Urban Economics*, *35*(1), pp. 1-27.

Ellul, R. (2019), Short-term rentals in Malta: a look at Airbnb listings, Central Bank of Malta *Policy Note*, November 2019.

Ellul, R., Darmanin, J. & Borg, I. (2019), Hedonic house price indices for Malta: A mortgage-based approach, Central Bank of Malta *Working Paper* WP/02/2019.

Engsted, T. & Pedersen, T. (2012), Predicting returns and rent growth in the housing market using the rent-to-price ratio: Evidence from the OECD countries, *Journal of International Money and Finance*, *53*, pp.257-275.

Falzon, J., Zammit, W. & Camilleri, D. (2005), House prices in Malta – an economic analysis, Central Bank of Malta *Quarterly Review*, Vol. 1, pp. 52-70.

Fox, R. & Tulip, P. (2014), Is housing overvalued?, Research Discussion Paper, Reserve Bank of Australia.

Gallin, J. (2008), The long-run relationship between house prices and rents, *Real Estate Economics, 36*(4), pp. 635-658.

Garner, T. & Verbrugge, R. (2009), Puzzling divergence of U.S. rents and user costs 1980-2004: Summary and extensions, *Price and productivity measurement, 1*, pp.125-146.

Gatt, W., Micallef, B., & Rapa, N. (2018), A macro-econometric model of the housing market in Malta, Central Bank of Malta *Research Bulletin 2018*, pp. 11-18.

Gatt, W. & Grech, O. (2016), An assessment of the Maltese housing market, Central Bank of Malta *Policy Note*, September 2016.

Grech, A.G. (2017), Did Malta's accession to the EU raise its potential growth?: A focus on the foreign workforce, *Journal of Economic Integration, 32*(4), pp. 873-890.

Grech, O. & Rapa, N. (2016), STREAM: a structural macro-econometric model of the Maltese economy (version 3.0), Central Bank of Malta *Working Paper* WP/01/2016.

Green, R. & Chang, Y. (2005), Did changing rents explain changing house prices during the 1990s?, In *American Real Estate and Urban Economics Association 2004 Annual Meetings*.

Hargreaves, B. (2008), What do rents tell us about house prices?, *International Journal of Housing Markets and Analysis, 1*(1), pp. 7-18.

Hatzvi, E. & Otto, G. (2008), Prices, rents and rational speculative bubbles in the Sydney housing market, *Economic Record*, 84(267), pp. 405-420.

Hendershott, P. & Shilling, J. (1980), The Economics of tenure choice: 1955-79, NBER Working Paper Series, No. 543.

Hill, R. & Syed, I. (2016), Hedonic price-rent ratios, user cost, and departures from equilibrium in the housing market, *Regional Science and Urban Economics*, 56, pp. 60-72.

Himmelberg, C., Mayer, C. & Sinai, T. (2005), Assessing high house prices: bubbles, fundamentals, and misperceptions, *Journal of Economic Perspectives, 19*(4), pp.67-92.

Howard, G. & Liebersohn, J. (2019), What explains U.S. house prices? Regional income divergence, 2019 Meeting Papers 1054, Society for Economic Dynamics, In *Proceedings of the Regional Income Divergence, 2019 Annual Meeting, St. Louis, MI, USA* (pp. 27-29).

Krakstad, F. & Oust, A. (2015), Long-run movements in house prices, *International Estate Review, 18*(4), pp. 429-454.

Lenarčič, Č. & Damjanović, M. (2015), Slovene residential property prices misalignment with fundamentals, Banka Slovenije Working Paper.

Manganelli, B., Morano, P., & Tajani, F. (2014), House prices and rents: the Italian experience, *WSEAS Transactions on Business and Economics*, 11(1), pp. 219-226.

Mankiw, N. & Weil, D. (1988), The baby boom, the baby bust, and the housing market, NBER Working Paper Series, pp. 2794.

Micallef, B. (2018), Constructing an index to examine house price misalignment with fundamentals in Malta, *International Journal of Housing Markets and Analysis*, *11*(2), pp. 315-334.

Olszewski, K., Augustyniak, H., Łaszek, J., Leszczyński, R. & Waszczuk, J. (2015), On the dynamics of the primary housing market and the forecasting of house prices, Narodowy Bank Polski.

Poterba, J. (1984), Tax subsidies to owner-occupied housing: an asset-market approach, *The Quarterly Journal of Economics*, *99*(4), pp. 729.

Rubio, M. (2018), Rented vs. owner-occupied housing and monetary policy, *The BE Journal of Macroeconomics*, *19*(1), September 2018.

Schneider, M. (2013), Are recent increases of residential property prices in Vienna and Austria justified by fundamentals?, *Monetary Policy & the Economy* Q4/13.

Sinai, T. & Souleles, N. (2005), Owner-occupied housing as a hedge against rent risk, *The Quarterly Journal of Economics*, 120(2), pp. 763-789.

Smith, M. & Smith, G. (2006), Bubble, bubble, where's the housing bubble?, *Brookings Papers On Economic Activity*, 2006(1), pp. 1-67.

UBS (2012), UBS Swiss Real Estate Bubble Index, Schweizer Immobilien, 2012Q3.

Vargas-Silva, C. (2017), Migrants and housing in the UK: experiences and impacts, The Migration Observatory, University of Oxford.

Xerri, K. (2017). Maltese law of letting and hiring: Lessons from the past and solutions for the future. *Revista Electrónica de Direito, RED*(3), 14.

Xerri, K. (2018), *Renting immovable in twenty-first century Malta: does the law provide a level playing field?*, BDL Publishing, Malta.