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The Dominance of the U.S. 30-Year Fixed Rate Residential Mortgage

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ABSTRACT

The United States (U.S.) is the only country in the world in which the 30-year fixed rate residential mortgage is the dominant home mortgage product. After reviewing mortgage offerings from a sample of countries to contrast their differences from the U.S. mortgage market, the key differential driving the U.S. market to the 30-year fixed rate mortgage is the active encouragement by government policy. This reinforcing promotion of the 30-year fixed rate mortgage is provided by government and "quasi" government institutions that guarantee the mortgage in the after-market. This guarantee coupled with the vast securitization of mortgages which require a standardization of the underlying product (of which the 30-year fixed rate mortgage is the largest sector) contributes to this dominance. Thus securitization, which allows lenders to offset interest rate and prepayment risks to the buyers of these securitized mortgage products, further drives the demand for more 30-year fixed rate offerings.

KEYWORD

Mortgage; fixed rate mortgage; adjustable rate mortgage; prepayment

Those attempting to buy a home have a number of financing options available to them depending on their credit standing. They could buy the home outright, but this is rarely an option. Sometimes this is possible when a home is sold and the sellers are looking to downsize and purchase a smaller less expensive home. But the typical route to homeownership is that the potential buyer secures a mortgage which includes an equity stake (i.e., the down payment). The greater the down payment (i.e., the bigger the equity position taken on by the buyer and thus the greater the amount of risk assumed), the lower the interest rate attached to the mortgage. The most frequent down payment in the U.S. market without the additional requirement of having to pay mortgage insurance to protect the lender is 20%.1 Not only do mortgage options differ from state to state, but there are vast differences among developed countries. In the U.S. mortgage marketplace, the dominant residential mortgage is the 30-year fixed rate mortgage (FRM), which is not consistent with the rest of the world.

The layout of this report starts with a brief review of mortgage options (fixed rate versus adjustable rate) in Section "Mortgage Options." The next two sections provide a summary of the mortgage market in a select number of European and other large countries to contrast the mortgage policies and trends within the United States. Section "Reasons of the Dominance of 30 year Fixed Rate Mortgage within the U.S." outlines the key factors leading to the dominance of the 30 year fixed rate mortgage within the U.S. residential housing market. The following section addresses the policy implications that have led to the 30-year FRM focusing on these government policies that helped promote the use of the fixed rate mortgage over the adjustable rate alternative. Finally, the conclusion summarizes the key factors associated with the dominance of the 30-year fixed rate mortgage within the U.S. residential mortgage market.

It should be noted that others have also looked into this issue. For instance, Lea (2010) focuses on the Dodd-Frank Financial Reform Bill's impact on the U.S. Mortgage Market. Lea also offers a historical perspective which ended in 2008. Although similar to Lea's coverage, our updated analysis incorporates a period in which the European Union is attempting

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Table 1. Mortgage summary by EU-28 countries.

Country	Mortgage[a]	DTI (%)	LTV (%)	Common mortgage
United Kingdom	1,575,990	97.7	72	Variable (fixed for 5 yrs)
Germany	1,445,987	68.5	78	Fixed rate 10–15 yrs
France	1,009,562	68.5	87.3	Fixed rate 19.9 yrs.
Netherlands	714,367	187.6	100	Annuity and interest only 30 yr
Spain	490,806	66.9	66	Variable; fixed 10 yr
Austria	112,934	49.2	60	Variable rate
Belgium	246,528	95.6	80	Avg maturity 22.5 years
Bulgaria	4,715	15.1	75	Variable rate
Croatia	7,293	n/a	75	20–30 yr maturities w/ variable rates
Cyprus	12,463	66.7	80	22 yrs avg maturity; variable
Czech Republic	43,983	40.2	80	Variable (fixed 5–8 yrs w/ mat 20–30 yrs)
Denmark	251,705	167.2	80	Fixed rate; reset; and variable
Estonia	7,603	54.5	85	Floating rate w/ maturity up to 30 yrs
Finland	97,781	72.4	80	Housing loan with maturity 25 yrs
Greece	56,766	48.0	n/a	Floating rate
Hungary	13,604	18.1	61.8	14.5 yrs fixed
Ireland	83,301	76.0	80	Variable
Italy	379,054	32.2	n/a	Fixed 20–25 yrs
Latvia	4,102	23.2	90	21 yrs
Lithuania	7,758	28.1	80	30 yr 6-month EURIBOR mortgage
Luxembourg	33,064	144.8	80	Fixed 25–30 yrs
Malta	4,949	n/a	73	Fixed and variable
Poland	100,579	246.0	80	Variable 25–35 yrs
Portugal	93,952	68.5	90	Variable Euribor rate
Romania	15,820	13.5	75	Fixed (10 yr) and variable
Slovakia	25,438	48.0	90	Variable 4–30 yrs
Slovenia	6,239	22.8	60	20-yr variable; 15-yr fixed
Sweden	408,639	171.9	65	Variable (avg 7.5 yr (30–50 yr term)

Note. [a]2018 Outstanding mortgage values in mn EUR; DTI mortgages to disposable income.
Source: European Mortgage Federation (EMF) Hypostat 2019.

to move all of the EU-28 countries to more homogeneous mortgage products in terms of prepayment penalties, disclosures, and more opportunities for fixed rate offerings. This reinforces the continuing differences in the U.S. versus the European sector. The U.S. mortgage market has set the 30-year FRM as its primary option, but the EU still has no consistent offering across its member countries.

Mortgage Options

Mortgage options are typically separated into fixed versus adjustable (also called variable) rate mortgages. With a fixed rate mortgage (FRM), the borrower is guaranteed a fixed rate over the life of the mortgage. In contrast, the adjustable rate mortgage (ARM) has an interest rate reset at designated time intervals based on the existing market rate. Most adjustable rate mortgages start with a short time period in which the interest rate is fixed. This time period can vary from one month to five years or longer. After this fixed interest rate period, the interest rate is reset for an additional time period. For example, a 5/1 ARM locks in the initial rate for 5 years, followed by a rate that is adjusted annually. Both the periodic reset period and the reset mechanism must be disclosed at the origination of the mortgage. Another less used mortgage product is the interest only loan in which the borrower is only required to pay the interest cost each period. The principal amount does not change and is due as a lump sum payment at the end of the mortgage term.

For example, a 30-year 6% fixed rate $200,000 mortgage locks in a monthly payment (principal and interest) of $1,199.10 over the life of the mortgage. Even though both the mortgage payment and interest rate are fixed, the amount applied to interest and principal changes each month with the interest portion decreasing and the principal portion increasing.2 For instance, the amounts going towards principal and interest during the 24th month are $223.30 and $975.80, respectively. But during the 24th month, the corresponding values are $655.79 and $543.31. A variable rate mortgage needs the adjustment process defined before the mortgage can be written. For illustration in a 3/1 ARM with a 30 year term, the interest rate is fixed for first three years and then adjusts annually for the remaining 27 years. This initial rate is typically lower than the fixed rate offered at the same time to compensate for the added interest rate risk taken on by the borrower. Thereafter, the rate will be determined at some benchmark index rate plus a fixed premium. For instance if the ARM is defined as the prime rate plus 150 BP (basis points) adjusted annually, the new rate after the initial 3 years will be 6.5% if the prime is 5%. The base and the adjustment factor can be defined around any benchmark, such as London Interbank Offered Rate (LIBOR),3 1-year constant Treasury (CMT), and Euro Interbank Offered Rate (Euribor). Also a CAP (maximum value) and a FLOOR (minimum value) for the interest rate (both annually and lifetime) could be attached to the terms of the mortgage offering. On the $200,000 3/1 ARM offered at 5%, the monthly payment during the first three years would be $1,073.64, a savings of $125.46 versus the 6% fixed rate offering. The interest rate adjustments in the future will dictate which option (fixed versus variable) was the better choice. Most home buyers prefer the fixed rate option, especially in low interest rate environments, because it eliminates interest rate risk and are therefore willing to pay the initial interest differential.

Mortgage Options by Select European Countries

The European Mortgage Federation (EMF) Hypostat is an annual statistical report, encompassing data on recent developments in the EU-28 countries, i.e., the member states of the European Union. Key factors by country such as the amount of mortgages outstanding, debt to income ratio (DTI), mortgage loan to home valuation (LTV), and the most common type of mortgage product offered are highlighted in Table 1 for all EU-28 countries. The five countries with the highest amount of mortgages outstanding (million EUR) are: (1) United Kingdom (1,575,990), (2) Germany (1,445,987), France (1,009,562), the Netherlands (714,367), and Spain (490,806). The remaining 23 countries range from a low of 4,102 in Latvia to a high of 408,639 for Sweden. The DTI levels for the entire EU-28 countries range from a low of 13.5 percent in Romania to a high of 246 percent in Poland. The LTV ratio also shows a wide dispersion from a low of 60 percent in both Austria and Slovenia to a high of 100 in the Netherlands. Data for the five countries with the highest amounts of mortgages outstanding are expanded upon to contrast the mortgage market within the United States.

United Kingdom (UK)

The mortgage market in the UK historically revolved around: (1) a variable rate that is either based on the lender's standard variable rate (i.e., LIBOR) or a Bank of England tracker rate (typically its repo rate) and (2) initial fixed rate products. Fixed rate mortgages, now the most common, are offered in maturities that are not of a sufficient time period to pay off the balance due. Thus like most of Europe, they are seldom the FRM fully amortizing loans found within the U.S. marketplace. Historically, the 2-year fixed rate was the product of choice, but demand is moving towards the 5-year fixed. Unlike the U.S. FRM, the amortization process is not tied to the length of the fixed rate period.

The UK mortgage market does offer a variety of other mortgage options such as discount rate and capped rate mortgages. Discount rate mortgages offer a teaser rate that is lower than the market rate to generate sales. This discount rate lasts a fixed period of time (for example from 6 months to 5 years, but usually on the shorter side), after which the loan reverts to a typical variable rate loan with reset periods ranging from monthly to annually. Capped rate mortgages benefit from a ceiling on the upside of rates, but allows for decreases when rates decline, but usually within a collar (range). There is a higher cost associated with this type of loan since the lender takes on more of the interest rate risk. The dominate mortgage term in the UK market is approximately 25 years. Other key factors within the UK mortgage industry is that prepayment penalties (i.e., early repayment charge—ERC) vary by lender. Mortgages with an ERC also have an overpayment allowance typically 10% (i.e., the borrower can repay 10% of the outstanding balance without incurring an ERC). The ERC is calculated based on the balance after the allowance has been subtracted.4

Other less common UK mortgage products include: pension mortgages which are only available to a retiree who uses a lump sum from his/her pension to pay off the balance of the existing mortgage; self-certification mortgages based on a borrower's irregular income stream (i.e., commission

Table 2. Select mortgage data for the 5 largest mortgage countries in EU-28.

Section A: Ownership rates and debt to GDP ratios

Country	Home ownership rate[a]	Household debt to GDP 2007–2017[b]		
		2017	Min	Max
France	64.90%	64.8%	40.7%	66.5%
Germany	51.70%	53.1%	53.1%	70.8%
Netherlands	69.00%	106.0%	45.0%	119.1%
Spain	77.80%	68.7%	39.2%	87.5%
United Kingdom	63.40%	92.7%	57.1%	104.9%
European Union	66.40%	50.2%	39.3%	54.5%

Section B: Fixed versus variable rate mortgage percentage of new issues (2014–2018)[c]

Country	fixed >10	fixed 5–10	fixed 1–5	Variable
France	n/a	n/a	n/a	n/a
Germany	40.9	36.4	9.9	12.8
Netherlands	18.7	48.7	16.9	15.7
Spain	18.1	3.4	28.3	50.2
United Kingdom	0.1	1.7	85.9	12.3

Section C: Maximum LTV ratios (%)

Country	Typical LTV[d]	1971–1980[e]	1981–1990[e]	1991–2000[e]	2000–2007[f]	Typical 2018
France	67	80	80	80	100	87.3[d]
Germany	67	65	65	80	80	78[d]
Netherlands	90	75	75	75	125	86[e]
Spain	70	60	80	80	100	66[d]
United Kingdom	69	81	87	95	110	72[d]
United States	75	80	89	80	100	76[f]

[a]https://tradingeconomics.com/country-list/home-ownership-rate.
[b]https://www.ceicdata.com/en/indicator/russia/household-debt–of-nominal-gdp and https://tradingeconomics.com/country-list/households-debt-to-gdp.
[c]European Mortgage Markets Quarterly Reviews 2014–2018 (European Mortgage Federation (EMF) https://hypo.org/emf/publications/quarterly-reviews/.
[d]Green and Wachter; [e] Almeida et al. (2006); [f] Crowe et al. (2011); [g]EMF Hypostat 2019.
[h]Statista (2018); and [i]Statistra (2019).
Note. fixed >10: fixed rate mortgage for at least 10 years maturity; fixed 5–10: fixed rate mortgage for between 5 and 10 years maturity; fixed 1–5: fixed rate mortgage for between 1 and 5 years; and variable: fixed rate for 1 year or less.

income); endowment mortgages which utilize life insurance or other endowments to pay off the mortgage at maturity and are typically offered for longer terms such as 20 to 25 years; and to-let-mortgages offered on investment property that plans on using rental income generated to pay off the mortgage. Since the cash flows are more uncertain, a higher down payment is required.

Shown in Table 2: Section A, the UK's homeownership rate stands at 63.4%, which is slightly less than the European Union which averaged 66.4%. Household debt to GDP in 2017 was 92.7% with a range of 57.1% to 104.9% over the period 2007 through 2017. The EU's average in 2017 was only 50.2%. The breakdown of mortgage products shown in Section "Mortgage Options by Select European Countries" reveals only 0.1% of mortgages were fixed rate mortgages with maturities greater than 10 years and 1.7% for maturities between 5 and 10 years. The bulk of the mortgage market (85.9%) was for maturities between 1 and 5 years. The remaining 12.3% fall in the variable rate category. UK's typical LTV ratio (shown in Section "Mortgage Options by Select Countries Worldwide") stands at 69%. See Table 2 for the summary data of the top five mortgage countries in the European Union.

Germany

Germany, the second largest country ranked by mortgages outstanding, is also one of the stricter countries in terms of qualifying for a mortgage leading to a low percentage of home ownership at approximately fifty percent. But these strict policies help make it one of the countries with the least number of defaults. The most common mortgage in Germany is a hybrid fixed rate amortizing mortgage in which the payment is fixed but the portion going to interest and repayment changes over time. Maturities typically run from 5 through 15 years with longer amortization periods. Thus, if the mortgage is not paid off in full, it must be re-financed at the new market rate. There are a variety of options for setting both the annuity, the term, and prepayment options.

Other mortgage products include the seldom used interest only mortgages; a variable rate mortgage tied to Euribor with typical adjustment periods every three months; and a mortgage tied to one's government pension. Prepayment penalties exist on fixed rate mortgages, but not variable rate ones. Penalties are equal to the amount of interest and reinvestment losses the lender would experience. The only exception is if the property is sold. Mortgage funding is available through deposits, mortgage covered bonds, and other bank bonds. Origination primarily is from domestic banks (MFI) at 96% and life insurers at 4%. The typical LTV ratio is 78% for an existing single family home.5

France

Although the French mortgage market historically included both fixed and variable rate mortgage products, almost all mortgages in recent times are issued with fixed rates (approximately 99%). Following the global trend, the tradeoff is a higher initial rate on the fixed rate product versus the lower initial rate on the variable rate mortgage due to the higher interest rate risk facing the lender. During the current low interest rate environment, there is little rate differential and therefore little incentive to undertake a variable rate mortgage. Note that there are prepayment penalties for both variable and fixed rate mortgages. Caps on the penalties are a maximum of 6 months of interest or 3 percent of the outstanding balance. Prepayment penalties can be waived in cases of unemployment, death, and certain types of job changes.

Variable rate mortgages can take on many forms. One example is the flexible mortgage that allows the mortgagee the option of varying the amount of repayments over time within a predetermined set of upper and lower bounds. When issued, the variable rate offerings are typically tied to the Euribor three-month or one-year rate. Common variable rate mortgages place a cap on the variable rate usually around 2% or 3%. A modified form of this mortgage is completely variable, but the amount of the monthly payment has an upper limit. The maturity of the loan is extended to accommodate this protection. The average term of the real estate loan was 19.9 year in 2018. The LTV ratio was 87.3% in 2018, showing a slight increase overtime.6 Similar to the U.S. markets annual percentage rate requirements must be disclosed on all loan products to make cost comparisons more reliable. France requires the disclosure of the Taux Effectif Global (TEG), which includes the lenders fees and associated costs with the loan (i.e., administration costs and insurance).

Netherlands

Within the Netherland's mortgage market both fixed (linear) and variable (annuity or repayment) rate mortgages are offered. Within the variable rate mortgage, the rate is tied to Euribor and the borrower repays a fixed amount of capital each month plus a fluctuating interest payment. Mortgage periods are longer than most other European countries with typical terms ranging from 10 through 30 years. Restricted interest only mortgages are another option.

Similar to the U.S. mortgage market guarantees offered by the Federal National Mortgage Association (Fannie Mae), the Nationale Hyotheek Garantie (NHG) guarantees repayment of the mortgage to the benefit of the lender with both upfront and ongoing costs for this insurance paid by the mortgagee. Prepayments are limited to 10% annually, except in hardship cases or for certain relocations. The penalty is equal to the yield maintenance lost by the lender. The maximum LTV ratio in 2018 was 100%, as shown in Table 1. The range of LTV ratios overtime are shown in Table 2: Section C.7

Spain

Historically, approximately 10 percent of Spain's mortgage market was in the fixed rate category, but recent encouragement from the Bank of Spain, the percentage of fixed rate offerings have increased to 34%. Terms for full term fixed rate mortgages run from 10 to 20 years. Variable rate offerings are tied to Euribor and reset semiannually or annually with caps and floors. Terms typically exceed the fixed rate market ranging between 20 and 25 years. Both types of mortgages have prepayment penalties, which are much higher on the fixed rate option. Variable rate mortgage prepayments can only be made at renewal dates with maximum penalties set at 0.5% in the first 5 years and 0.25% thereafter. The fixed rate prepayment charge can run as high as 4.5% of the outstanding amount. A maximum of 10% of the outstanding balance can be repaid each year without penalty on any mortgage. A hybrid loan is also an option which is fixed for an initial period and then reverts to a variable rate mortgage. LTV ratios on new residential loans averaged 66% in 2018.8

Mortgage Options by Select Countries Worldwide

A sample of other countries are selected to show a wide contrast of worldwide mortgage policies. A summary of home ownership rates by country show several interesting trends. The Republic of Korea shows an average rate of home ownership of 55.74% from 2006 through 2018, peaking in 2017 and 2018 at 57.7%. This is only slightly more than Germany (51.7%), one of the lowest rates of the EU-28 countries. In the low home ownership rate countries, rentals dominate and the most frequent housing option is for apartments. The two countries with the highest reported homeownership rates were China at 90% and Russia at 87.1%, but their economies and governing processes are unique and not easily duplicated in other countries.9

An interesting factor is that the household debt to GDP ratio is not correlated with homeownership rates. For instance, the three lowest homeownership rate countries have vastly different household debt to GDP rates reported as current (minimum; maximum 2007 through 2017): Switzerland 127.8% (104.5%; 127.8%), Germany 53.1% (53.1%; 70.8%), and the Republic of Korea 97.5% (66.6%; 97.5%). Note that the typical country has increasing household debt to GDP ratios. Exceptions include Germany, Ireland, Japan, Spain, and the UK. See Table 2 for housing ownership rates and housing debt to GDP for the five European countries with the highest amount of mortgages outstanding.10

Unlike the U.S. mortgage market, most countries seldom include the 30-year fixed rate mortgage as a financing option. Countries relying primarily on the variable rate mortgage product with short initial fixed rate periods include Australia, Ireland, Republic of Korea and Spain.11 This is contrasted with the short- and medium-term fixed rate mortgages found in Canada, Denmark, Germany, the Netherlands, and Switzerland that must be refinanced periodically. Another contrasting point is the variations in prepayment penalties which are designed to compensate the lender for lost interest over the remaining term, especially within the fixed rate mortgage market.

Australia

The Australian mortgage market offers both fixed rate ($<$10%) and variable ($>$ 90%) rate mortgages. Unlike the U.S. market, fixed rate mortgages are only offered for short maturities, typically between one and five years but based on amortizing periods as long as 25 years which help set payments that are more affordable. These mortgages must then be refinanced with the rate, amortizing periods, and payments adjusted. Thus, the fixed rate mortgage needs to be refinanced at various future time periods similar to the adjustable mortgage, but for longer adjustment intervals. Note that the default mode is that the mortgage will convert to a variable rate loan unless the borrower specifically refinances for another fixed rate mortgage. Another key difference from the U.S. mortgage market is that fixed rate loans cannot be prepaid.

The common adjustable mortgage is called a Standard Variable Rate (SVR) mortgage where the bank decides the base rate. First time buyers may be offered a teaser rate as an incentive to pursue home ownership, similar to that of many countries including the United States. This first time teaser offering is then converted to the SVR mortgage after a short time frame such as one year. The variable rate loan option does permit prepayment. The Australia mortgage marketplace also offers three other mortgage options: (1) an interest only mortgage option, (2) a split rate loan, and (3) a flexible mortgage. The split rate loan allows a portion of loan to be fixed and the other part variable which adds flexibility since the variable portion can be prepaid. The flexible mortgage allows for non-constant amortization (i.e., adjustments to the amortization process due to an option for skipping payments called payment holidays). This is primarily used by workers in nontraditional jobs or independent contractors with uneven payment streams.12

Canada

Canada also offers both variable and fixed rate mortgages, but there are no 30-year fixed rate mortgages. What is offered is a fixed rate five-year mortgage that is amortized over 25 years. Every five years the mortgage interest is reset and the monthly payment schedule is adjusted. This is effectively a variable rate loan with 5 year resets. From a mortgage lender's viewpoint, this make more sense than a 30-year fixed rate mortgage in which the lenders are exposed to all of the interest rate risks. The Canadian bankers also have the added benefit of severe prepayment clauses during each 5 year period. But all is not on the banker's side. Canadian mortgages have a special feature that permits portability (i.e., if the mortgagee moves before the five-year term, this mortgage can be applied to the new home). Unlike the United States, mortgage interest is not tax deductible in Canada which increases the actual cost of the home purchase. Most mortgages are held by the original bank and not resold in the marketplace, but securitization has steadily increased over time. In 1995, securitization was about 5% for National Housing Act Mortgage-Backed Securities and 0% for private securitization. In 2013, securitization increased to 35% and 2% for government and private mortgages respectively. The Canadian mortgage requirements show a process of tight regulations and eligibility requirements that have proven their soundness over time. Default rates have always been below the 1% level.13

Similar to the U.S. mortgage market, those without at least a 20% down payment are forced to carry mortgage insurance with initial fees approximately 1.00%–3.50% of the principal borrowed. This initial mortgage insurance payment could either be upfront (i.e., added to the principal amount borrowed) or spread out over the life of the mortgage. The maximum term to be insured by the Canadian Mortgage and Housing Corporation (CMHC), the government agency that dominates the mortgage insurance market, is 25 years. Prepayments of up to 20 percent of the outstanding balance per year are permitted, but with a penalty equal to the cost of lost interest to the lender. 14

China

The Chinese mortgage market realistically began with the economic reforms in 1978 and has grown since. Today, there are two kinds of housing finance institutions: general and specialist. The general institutions are the dominant player in the market (market share >80 percent) and are led by the five state-owned commercial banks. The specialist institutions are led by Housing Saving Banks (HSB). These banks generate funding for housing development from compulsory savings in the form of Housing Provident Funds (HPF) accounts that can only be used for housing expenses: home purchases, self-building, or renovations. The funds are generated from compulsory savings by workers which are matched by contributions from employers within limits. HPF accounts are only offered to employees of state-owned enterprises. Funds unused for housing cannot be withdrawn until retirement or when the employee moves permanently to another city.

The two key mortgage products include commercial individual loans (offered through the general sector) and HPF loans (offered through the specialist sector only to borrowers holding HPF accounts). The advantage of commercial loans are that they are more flexible (higher loan limits and more maturity terms) then HPF loans, but they levy higher interest costs. HPF loans have imposed loan amount limits and thus in many cases must be combined with commercial individual loans to create a hybrid mortgage product to fund the house purchase. The Chinese mortgage offerings are all variable rate tied to a baseline set by the central bank. Terms have a maximum of 30 years and require 20% down payments. With strict qualifying requirements, default rates are approximately 1%, with greater defaults in the rural areas. China also has no prepayment penalties.15

Japan

Japan offers both fixed and variable rate mortgages. They also offer a hybrid loan, which is fixed for 10 years and then it is rolled over into variable rate mortgage. The rates offered on both the fixed and variable rate loans are some of the lowest in the world. The extremely low rates recently have occurred because of the Bank of Japan's recent negative interest rate policy. For instance in 2016, flat 35 loans (government-sponsored fixed interest loans available from private lenders with terms of 21-35 years and loan-to-value ratios of less than 90%) had an offering interest rate range between 0.03% to 1.09%. The variable rate offerings are tied to the prime rate. Similar to the typical mortgage within the U.S. market, Japan has no prepayment penalties.16

Russia

A peculiarity of Russian mortgages is that the type of mortgage varies by category of property. The mortgage terms to purchase an apartment or flat, for example, will differ significantly from the mortgage terms on the purchase a country cottage. However, regardless of the property type, most mortgages will be structured for principal repayment plus floating-rate interest. The mortgage market is predominately stronger in Moscow than any other city or region of the country. The share of mortgages as a percentage of GDP is relatively low compared to other developed countries at only about 1 percent in 2006 and increasing to 5 percent in 2017. Predictions are that as the economy

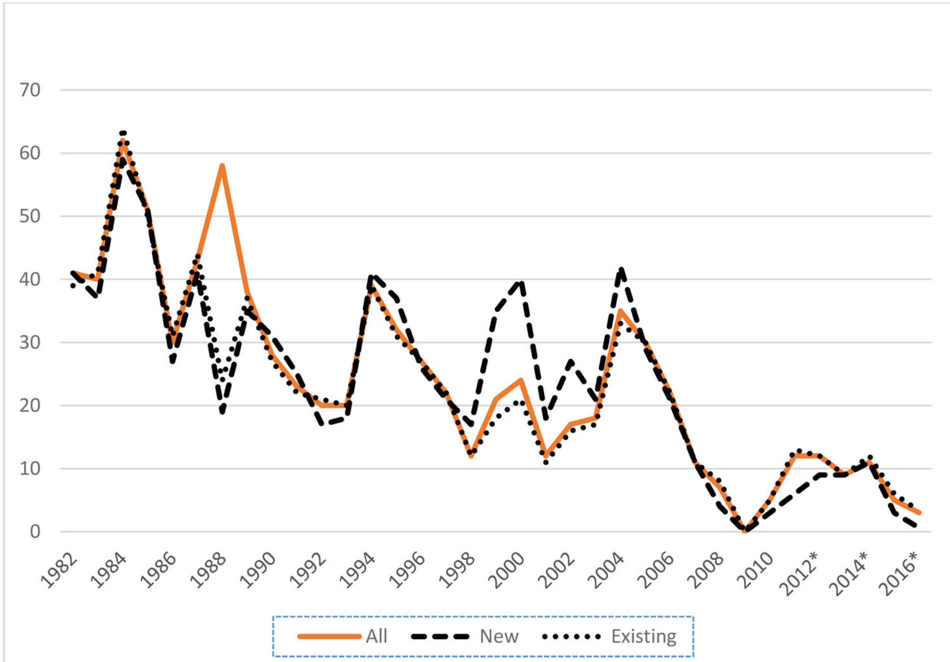

Figure 1. ARM—Percentage of mortgage market.
Source: Federal Housing Finance Agency: Historical Summary Tables 9 (All Homes), 10 (Newly Built Homes), and 11 (Previously Occupied Homes) https://www.fhfa.gov/DataTools/Downloads/pages/monthly-interest-rate-data.aspx

improves, so will the mortgage market. Due to high qualifying standards, the risk premium added to the interest costs were close to 0% in 2016, but expected to rise in the future.17

Republic of Korea (South Korea)

South Korea offers both fixed rate (≈40%) and variable rate (≈60%) mortgages. The trend over time is an increase in fixed rate offerings due to the government strongly encouraging banks to offer more fixed rate amortizing mortgages. Fixed rate mortgage maturities have also increased over time with the Korea Housing Finance Corporation (KHFC) buying fixed rate conventional mortgages up to 20 years maturity and 70 percent LTV (loan to value ratio) with prepayment penalties. Adjustable rate mortgages are indexed to the CD rate or the Cost of Funds (COF) Index. Prepayment penalties on fixed rate mortgages are fixed on a 3 year declining scale of 1.5, 1.0, and 0.5 percent respectively.18

Reasons of the Dominance of 30 Year Fixed Rate Mortgage within the U.S

Within the U.S. residential mortgage market, a significant segment of financing relied on adjustable rate, short-term mortgages as displayed in Figure 1 for the years 1982 through 2016. The percentage of mortgages using ARMs was consistent across the three categories: All Homes, New Homes, and Existing Homes. The highest level of ARMs occurred in 1984 at 62% for the all homes category. This is contrasted with the low percentages that occurred more recently in 2016 at 3% for the all homes category. After 2016, the amount of adjustable rate mortgages was approximately 0.19 The adjustable rate mortgage was the dominant mortgage product prior to the reporting period shown in Figure 1.

Browne (1982) does a remarkable job outlining the historical significance of the adjustable rate mortgage and Saulnier et al. (1958) outlines the first major initiatives of the federal government into farm loans and how it progressed into initiatives for home loans. Supply and demand is also a key factor in the mortgage type decision. For instance, Kim and Ziobrowski (2016) document the relationship between the perceived borrower's risk and the choice between undertaking an adjustable or a fixed rate mortgage. During high (low) short-term interest rate environments, borrowers perceive a low (high) probability of rate increases (decreases). Hence, the desire for ARMs (FRMs). They further document an avoidance of ARMs during a down housing market due to an increase of perceived risk.

To further contrast the U.S. mortgage market from other countries, Table 2: Section B shows the variation in issuance of mortgages for the top five European counties ranked by outstanding mortgage amounts as highlighted in the European Mortgage Markets Quarterly Reviews. The mortgages are categorized as fixed rate mortgages for terms greater than 10 years, for terms greater than 5 but less than or equal to 10 years, and for terms greater than 1 but less than or equal to 5 years, and variable rate loans with 1 year or less adjustments. Although not shown, the countries with the largest percentage of fixed rate mortgages with maturities over 10 years are Belgium (76.6%), Denmark (45.7%) and Italy (40.3%). The countries with the greatest percentage of variable rate mortgages with adjustments of less than 1 year are Poland (100%), Portugal (88.9%), and Romania (87.3%).

The government's attempt to restart the economy after the depression with the creation of the Federal Housing Authority (FHA) in 1934 was the first major initiative by the government to alter the mortgage market's reliance on annual mortgage renegotiations.20 After the Second World War, the government intervened in the mortgage market again with the creation of the Veterans Administration (VA) loan program. It was created to reward our veterans for their service and to again encourage homeownership over renting. Under the G.I. Bill (i.e., the Servicemen's Readjustment Act—1944), standard mortgage requirements were adjusted to favor veterans. For instance, the loan to value ratio requirement was reduced to 95% for 30 year mortgages, allowing veterans to purchase a home with only a 5 percent down payment.21

These early initiatives by the Federal government encouraged long-term fixed rate mortgages verses short-term variable rate mortgages. Table 2: Section C shows a contrast of the loan to value (LTV) ratios in the United States mortgage market during the period 1971 through 2007 and for 2018 versus the five largest mortgage market countries located in the European Union. For instance, the typical LTV ratio in the U.S. was 75% with a maximum LTV ratio of 100% during the 2000–2007 period. In 2018 the ratio averaged 76%. Three other countries also had LTV ratios of 100% during this reporting period: France, Spain, and Ireland (which is not shown in the table). But the United Kingdom and the Netherlands exceeded the 100% top rate with 110% and 125% LTV ratios respectively.

But the dominance of the 30-year fixed rate mortgage within the U.S. could not exist without the big three government sponsored agencies: Government National Mortgage Association—Ginnie Mae (1968), Federal National Mortgage Association—Fannie Mae (chartered in 1938), and Federal Home Loan Mortgage Corporation—Freddie Mac (chartered in 1970).22 Through the securitization process associated with these agencies, banks are able to originate fixed rate mortgages with maturities of 30 years and pass on the risk to the buyers of these securitized mortgage products. Thus, the U.S. mortgage market is dominated by 30-year fixed rate mortgage originations. The more homogeneous the mortgage, the easier it is to securitize.23 Besides the implicit guarantee offered by the three government sponsored agencies, fixed rate mortgage dominance is also being driven by the low rates offered in the market and the lack of substantial differences between fixed rate and adjustable rate offerings.

The dominance of the fixed rate mortgage originate through the securitization process. Without these agencies, the banks would have to absorb the interest rate risk. In periods when interest rates rise, the banks would be forced to pay higher rates on their deposits while at the same time receiving a lower fixed rate of interest from these mortgages. When interest rates decrease, the banks are able to pay lower deposit rates, but the advantage of offsetting these lower deposit rates with higher returns for the outstanding mortgage pool is compromised with the increase in prepayments typically due to refinancing activity. With liberal prepayment terms including no prepayment penalty within most mortgage contracts, there is little to discourage the mortgage holders from seeking lower rates through refinancing.

Most of the mortgage market worldwide imposes some type of prepayment clause and does not rely on the type of government agencies found within the U.S. to support the mortgage market. Thus, fixed rate mortgages in other sectors of the world are for much shorter terms, but which are lengthening in the current low interest rate environment. Commonly, other countries offer fixed rate mortgages that lock in rates for 5 or 10 years. At each maturity, the mortgage is refinanced at whatever the prevailing rate is at that point in time. Another contributor to the mortgages (or the push for encouraging home ownership) is the deductibility of interest on taxes. But this applies to both fixed and adjustable rate mortgages.

One of the early drivers of the fixed rate mortgage in the U.S. was the FHA which was established to help low- and moderate-income buyers enter the housing market. Key features include low down payment (3.5 percent of the mortgage amount) and low qualifying hurdles in terms of credit, asset, and income guidelines. Although no minimum income is required, you need to show that you have enough to repay the loan. Common metrics used include upper limits of mortgage debt to income ratio of 31% and total debt to income ratio of 43%.24 The FHA does not issue the loan, it only insures the loan. This insurance acts as a guarantee to lenders, since if the borrower fails to repay the loan, the FHA will reimburse the lender. This insurance carries an upfront cost, plus an ongoing monthly mortgage premium of the remaining balance. The upfront mortgage insurance premium (UFMIP) can be financed as part of the mortgage loan. The UFMIP is based on the amount borrowed and the amount of the down payment is 175 Basis Points (i.e., 1.75%) of the base loan amount. The allowable mortgage parameters are dependent on the area in which the home is purchased. A one-unit home is $275,665 (set at 65 percent of the national conforming limit (NCL) of $424,100) or $636,150 (set at 150 percent of the NCL) for a low and high cost area respectively. Term limits are set at 15 to 30 years.25

Very few countries have any type of government guarantee. Canada (CMHC), the Netherlands (NHG), and the United States (FHA) have government mortgage insurers. Canada (CMHC), Japan (JHF), and the United States (GNMA) offer specific government security guarantees. Japan, Republic of Korea (Korean Housing Finance Corporation), and the United States (Fannie Mae, Freddie Mac, and the FHLB) offer assistance through government sponsored enterprises.26 Thus the 30-year fully amortizing fixed-rate mortgage, by far the most popular current mortgage product for America's homebuyers, has grown with the increases in government supported guarantees. In summary, about 90 percent of U.S. homebuyers chose the 30-year fixed-rate mortgage in 2016. Six percent of U.S. homebuyers chose 15-year fixed-rate loans, 2 percent chose adjustable-rate mortgages (ARMs), and 2 percent chose loans with other terms.27

A comparison of the 15-year and 30-year FRM illustrates one of the key factors for potential homebuyers choosing the 30-year FRM. The 30 year loan offers lower payments. But this lower payment comes at a cost, i.e., the total interest repaid is substantially higher. For example, the total interest paid over a $200,000 mortgage at 6% over 30 years is $231,676 versus the 15 year alternative at $103,788. The savings should even be larger since 15 year FRM typically offer lower interest rates versus the 30 year FRM. When comparing FRM versus ARM, the key benefit is that the fixed rate mortgage offers a fixed payment for life of the mortgage. Thus avoiding any surprise changes to the mortgage payment. Although the payment is fixed the amount going towards principal and the amount going towards interest changes with each monthly payment. Fear of rate changes have most borrowers focused on FRM. Both mortgage products most often allow the mortgagee the freedom to prepay without penalty which was reinforced with the changes within the Dodd-Frank Act (2010): Title XIV—Mortgage Reform and Anti-Predatory Lending Act.28

When a prepayment penalty exists, it must be written within the mortgage contract that a fee will be charged if all or part of the mortgage is paid off early. Only a small portion of the U.S. mortgages have a prepayment penalty. There are two types of prepayment clauses. First, a soft prepayment penalty applies only when a mortgage payoff due to refinancing, but not on a home sale. The second, the hard prepayment penalty, applies anytime the entire balance is prepaid, from a home sale or a refinancing within a set time period usually 5 years. The penalty is typically prorated over this penalty phase such that the penalty is reduce each year the mortgage is held. Prepayment penalties do not normally apply if you pay extra principal on your mortgage in small increments over time.29 Prepayment penalties are prohibited on FHA and VA loans, and also on loans made by federally chartered credit unions. On all other loans, any restrictions are set by the state in which the property is located. Penalties are usually expressed as a percent of the outstanding

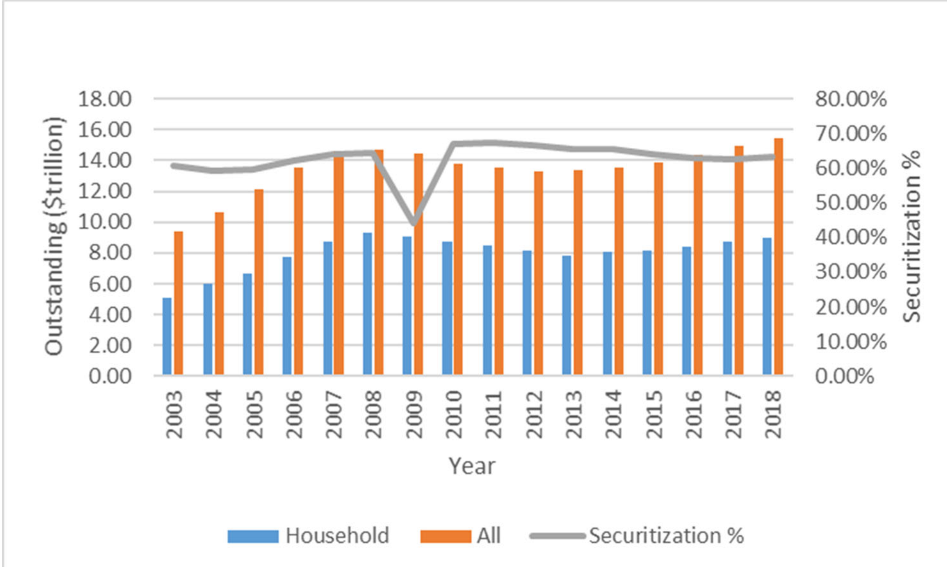

Figure 2. U.S. mortgage market.
Source: FRBNY Center for Microeconomic Data—Quarterly Report on Household Debt and Credit August 2019 (Data Underlying Report) https://www.newyorkfed.org/microeconomics/databank.html
Note. Dollar amounts in $(trillion, real) reported Q2.

balance at time of prepayment, or a specified number of months of interest.30

Policy Implications

The trend in U.S. mortgage debt outstanding supports the fact that government policies have indeed helped to shape the housing market by encouraging more families to pursue homeownership. Figure 2 shows outstanding household mortgage debt, all debt, and percent of debt securitized in 2003 through 2018. For instance, in 2003, real household mortgage debt outstanding was approximately $5 trillion. It peaked in 2008 at $9.27 trillion and then declined over the next four years before increasing again to $9.41 trillion in the second quarter of 2019. Although not shown, this trend occurs across all categories: high/low FICO scores and for first time/non-first time borrowers. Figure 2 also reinforces that the securitization rate was consistent at approximately 60% except for a drop off in 2009.31

Other real estate factors pinpoint what class of citizens benefit the most from these government policies. From Table 3: Section A, the top two deciles of the income brackets show homeownership rates of 80 to 90 percent versus the lower two deciles of 30–40 percent. These results are consistent over time. Table 3: Section B, also divided by income levels, shows the disparity of the median price home. Table 3 reinforces the advantages of the government's housing policies towards its more wealthy constituents. This is the group that least needs the government's assistance of mortgage interest deductions and subsidized mortgage insurance for the securitization of mortgage assets.

With this skewed mix of mortgage participants, should the U.S. Government continue to promote one type of mortgage product over any others? Currently, it primarily promotes the 30 year fixed rate mortgage. But is this the best mortgage product for all involved parties over all time periods including all types of potential homeowner/mortgagee and the lender/mortgagor? Should families with limited income continue to be encouraged to even participate in the housing marketplace? This is one of the key functions of the Federal Housing Administration (FHA). Government policy also advocates homeownership versus renting and has done so since the great depression in the 1930s. The Internal Revenue Service (IRS) policies also encourage homeownership versus renting since the mortgagee is offered a tax subsidy on interest costs through the process of being able to use interest expense as a tax deduction. Thus, the interest rate offered on mortgages is not a true rate of interest since it is not fully paid by the homebuyer. Part of the cost is spread over all the U.S. taxpayers, especially those not currently paying on a mortgage.

Table 3. Income effects.

Section A: Percent of families with primary residence segmented by percentage of income level in the U.S.

	Percent of income					
Year	<20%	20–39.9	40–59.9	60–79.9	80–89.9	90–100
1989	32.9	54.9	65.4	76.4	86.2	93.5
1992	38.9	56.4	61.8	75.9	83.2	90.1
1995	39.7	55.4	62.6	77.3	85.9	91.3
1998	38.8	55.3	67.3	79.1	88.2	93.1
2001	40.6	57.3	66.0	81.8	90.9	94.4
2004	40.3	56.9	71.6	83.1	91.9	94.5
2007	41.4	55.2	69.3	83.9	92.6	94.3
2010	37.2	55.9	71.1	80.7	90.6	92.4
2013	37.0	53.8	63.0	81.1	88.2	93.6
2016	34.6	51.5	63.8	79.0	87.7	91.5
AVG	38.1	55.3	66.2	79.8	88.5	92.9

Section B: Median value of primary residence for families with holdings segmented by percentage of income level in the U.S.

	Percent of income					
Year	<20%	20–39.9	40–59.9	60–79.9	80–89.9	90–100
1989	56.0	93.3	110.1	139.9	186.6	373.2
1992	67.1	83.9	110.7	142.6	167.7	301.9
1995	70.5	101.8	117.5	148.8	187.9	274.1
1998	81.2	110.7	125.4	162.3	202.1	332.0
2001	88.1	108.4	128.7	176.1	237.1	406.5
2004	89.0	127.2	171.7	222.6	286.2	572.3
2007	115.8	139.0	173.7	249.0	347.4	579.0
2010	98.4	121.6	149.2	193.4	276.3	525.0
2013	82.5	109.2	128.9	175.3	257.8	489.8
2016	86.0	120.0	150.0	190.4	275.0	550.0
AVG	83.5	111.5	136.6	180.0	242.4	440.4

Source: 2016 SCF Chartbook.
https://www.federalreserve.gov/econres/files/bulletincharts.pdf.

Thus, the net borrowing cost is reduced to the borrower.

As noted previously in the comparison of the U.S. mortgage market and that practiced elsewhere in the world, the U.S. is unique in financially supporting federal government mortgage insurance over the private insurance market. The government's position was further solidified with the takeover by conservatorship of Fannie Mae and Freddie Mac after the housing crisis in 2008 and through the policies of the government corporation Ginnie Mae within the U.S. Department of Housing and Urban Development (HUD). Other governmental agencies also continue to support and insure mortgages for specific groups include the Federal Housing Administration (FHA), Veterans Affairs (VA), and the U.S. Department of Agriculture Rural Development Program.

Other U.S. policies encourage the use of fixed rate mortgages (FRMs) by allowing the mortgagee a risk free prepayment option, i.e., no prepayment penalty attached to the mortgage allowing the mortgage holder to prepay in small increments or prepay the entire balance at any time. This is especially valuable for refinancing when interest rates decline. Early encouragement of this free option through governmental policies is shown by a Fannie Mae rule initiated in 1979 to only purchase FRMs without prepayment penalties.32 Another government policy is to shift the risk of foreclosure to the lender. It is a risk to the lender since the litigation process is time consuming and may take several years to complete while allowing the borrower to stay in the house without making any additional payments on their outstanding loan.33 Therefore the longer the mortgage's maturity, the more risk undertaken by the lender. A popular scapegoat for the increase in foreclosures during housing crisis is to blame the adjustable rate mortgage segment but this may be overreaching. Foote et al. (2012) notes that during the housing crisis, adjustable rate mortgages that had a payment increase accounted for only 12 percent of foreclosures between 2007 and 2010. In fact, the majority of foreclosures occurred in the FRM market. FRM share of default during this same time period was 59%.

When lenders offer a 30 year mortgage, they are locking in a fixed rate of return. If rates go higher, the lender is stuck with a suboptimum investment, i.e., a mortgage that is returning a lower interest

Table 4. National mortgage statistics: 1988–2016 (sample of years reported).

	Yield differences		Payment differences		Interest differences		5 year differences	
Date	30–15	30–ARM	30–15	30–ARM	30–15	30–ARM	30–15	30–ARM
1988	0.244%	0.385%	-$350.38	$57.31	$267,105.82	$20,630.71	$32,646.42	$3,902.83
1989	0.243%	0.303%	-$352.52	$45.20	$264,711.18	$16,272.37	$32,718.05	$3,077.90
1994	0.473%	1.074%	-$376.66	$149.42	$208,958.67	$53,792.41	$37,333.97	$10,851.86
1999	0.380%	0.623%	-$411.57	$84.54	$178,661.41	$30,436.07	$37,132.68	$6,276.47
2004	0.618%	1.011%	-$423.27	$126.46	$138,945.10	$45,524.22	$40,573.13	$10,083.26
2009	0.478%	0.493%	-$446.33	$61.04	$126,127.33	$21,973.26	$39,264.79	$4,905.97
2014	0.790%	1.155%	-$441.54	$130.67	$98,060.18	$47,041.36	$42,565.61	$11,326.48
2016	0.606%	0.750%	-$469.50	$82.84	$81,301.16	$29,821.76	$40,709.21	$7,323.53
Average	0.482%	0.712%	-$415.03	$90.39	$163,055.74	$32,539.60	$38,270.59	$7,098.05
Std Dev	0.159%	0.306%	$32.40	$34.28	$52,082.32	$12,341.95	$2,714.08	$2,997.02
Maximum	0.829%	1.312%	-$350.38	$152.25	$267,105.82	$54,809.10	$42,924.77	$12,923.08
Minimum	0.243%	0.247%	-$469.50	$32.40	$81,301.16	$11,663.74	$32,646.42	$2,476.64

Source: https://www.hsh.com/monthly-mortgage-rates.html.
Note. 30 indicates 30 year fixed rate mortgage; 15 indicates 15 year fixed rate mortgage; and ARM indicates 5/1 Hybrid ARM with 30 years amortization (i.e., an adjustable annual mortgage rate with a fixed rate for the first 5 years).
Values based on $200,000 mortgage; 1988 (September–December); 2016 (January–September).

rate than found for comparable investment options found within the marketplace. If rates drop, the borrower has the opportunity to refinance at this lower rate with very little cost so the lender loses the upside potential. Therefore, advocates for a freer market in line with the rest of the mortgage markets across various counties worldwide encourage U.S. Government policy that would limit influencing the mortgage market by letting the marketplace decide what type of mortgage is offered in terms of not only maturity, but fixed versus adjustable rates. They also support reducing government participation in the mortgage insurance business by restructuring both Fannie Mae and Freddie Mac.

What are the implications of favoring one mortgage product over another? The National Association of Realtors (NAR) notes that over the twenty year period 1985 through 2008, the median tenure for homeownership was just six years. Afterwards, the median tenure increased to approximately nine years. Therefore, the savings on a hybrid ARM (adjustable rate mortgage) could be significant. Using data compiled by HSH.com, the average difference between the rates offered on a 30 year fixed rate mortgage and a 5/1 ARM was 71.9 basis points over the period 1988 through 2016. This resulted in a monthly payment differential on a $200,000 mortgage of almost $100 (actual saving $90.39) and average interest savings over the first five years of this mortgage term of $7,098.05. The savings over the reporting period ranged from a gain of $2,476 (2007) to $12,923 (2011). The advantage over this five year holding period was always advantageous to the adjustable rate mortgage holder, except for one month (December 2008 at -$511).

Table 4 highlights these savings over a selection of years, as well as, averages, standard deviations, maximum and minimum values. This table reinforces the fact that adjustable mortgage rates are lower, at least initially which translates into lower monthly payments, less interest costs, and faster equity accumulation. With no prepayment penalty, the option to refinance to take advantage of lower rates exists under both types of mortgages. The table also illustrates, for those with extra disposable income, the advantages of a 15 year mortgage over a 30 year mortgage. Even though the payments can be significantly higher, the savings from interest costs, the quicker buildup of equity, and the opportunity to pay off the mortgage in a shorter time frame may be worthwhile.

Conclusion

The United States is unique in that it is the only country in the world that has as its primary mortgage offering the 30-year fixed rate mortgage. Besides having tax consequences for interest rate deductions34 on personal income tax filings, similar to several other countries, it is distinctively positioned by having the force of several government agencies encouraging and backing the 30-year fixed rate mortgage. Starting with the FHA, that facilitates home mortgages for low income individuals and the VA, that subsidizes home mortgages for veterans through low down payments and other qualifying modifications, the federal government chartered two "quasi" government agencies that offer insurance to guarantee mortgages against default. This not only allows, but encourages lenders to underwrite 30-year fixed rate mortgages. Lenders are freed from both interest rate and prepayment risks as soon as the mortgage is sold off and securitized. Buyers of these securitized mortgage products also benefit from this mortgage insurance, also decreasing their exposure to these risks. Without similar government intervention, the 30-year fixed rate mortgage could not become a profitable option within any other country's mortgage market.

Endnotes

1. Down payments vary by home purchaser, with prior home owners placing higher down payments and first time homeowners utilizing lower down payments. In realtor.com "Ante Up! U.S. Housing Markets with the Biggest—and—Smallest—Down Payments" two maps highlight where buyers make the biggest and smallest down payments. See https://www.realtor.com/news/trends/housing-markets-with-the-biggest-and-smallest-down-payments/

2. The calculation for the monthly mortgage payment (MP) is $MP = MB_0\left[\frac{i(1+i)^M}{(1+i)^M-1}\right]$ and the amount of the payment going towards principal in month m (scheduled principal payment (SPm) is $SP_m = MB_0\left[\frac{i(1+i)^{m-1}}{(1+i)^M-1}\right]$. Scheduled interest payment (SIm) is just $SI_m = MP - SP_m$. Note these calculations assume no prepayments. Any required mortgage insurance costs would be added to the monthly payment.

3. See a Primer on LIBOR's Phase Out and Transition http://corp.fhlbatl.com/resources/a-primer-on-libors-phase-out-and-transition/

4. See EMF Hypostat 2019 p. 112–113] and for the early repayment charge section of HSBC—UK Personal webpage. https://www.hsbc.co.uk/1/2/mortgages/mortgage-fees

5. EMF Hypostat 2019 p. 70–72 and for prepayment see https://www.howtogermany.com/pages/mortgage.html

6. EMF Hypostat 2019, pp. 68–69 and for prepayment see https://www.french-property.com/guides/france/finance-taxation/mortgages/terms/interest-rates/

7. See EMF Hypostat 2019 p. 92–93; Statista (2018) https://www.statista.com/statistics/961047/average-ltv-ratio-in-the-netherlands/
and https://www.expatica.com/nl/housing/Your-guide-to-Dutch-mortgages_101837.html

8. See EMF Hypostat 2019 p. 107–109; http://www.imsmortgages.com/mortgages-in-spain/mortgage-product-types-in-spain/; and http://thecorner.eu/financial-markets/mortgage-market-shift-now-more-at-a-fixed-rate-than-a-variable-rate/61464/

9. There are several European counties with higher home ownership rates that are not included in the table: Romania (96.0%); Macedonia (90.6%); Lithuania (90.3%); Croatia (90.0%); Slovakia (89.5%); Hungary (86.3%); Poland (83.4%); Norway (82.7%); Serbia (82.4%); Bulgaria (82.3%); Estonia (81.4%); Malta (81.4%); Latvia (80.9%); Czech Republic (78.2%); and Iceland (77.8%). See https://tradingeconomics.com/country-list/home-ownership-rate for additional details.

10. For additional countries see https://tradingeconomics.com/country-list/home-ownership-rate for homeownership rates and https://www.ceicdata.com/en/indicator/russia/household-debt–of-nominal-gdp and https://tradingeconomics.com/country-list/households-debt-to-gdp for household debt to GDP ratios.

11. See "International Comparison of Mortgage Product Offerings" by Michael Lea 9/27/2010 https://www.mba.org/news-research-and-resources/research-and-economics/research-institute-for-housing-america/published-reports/2011-2009/international-comparison-of-mortgage-product-offerings

12. See RMBS Performance Watch: Australia Part 1—Market Overview (2018) https://www.spratings.com/documents/20184/5781227/Australian+RMBS+PW%2C+Dec+31%2C+2018+Part+1+_Market+Overview.pdf/15ecf82f-65dd-c414-7bf9-22a1a0a750d7 and http://www.infochoice.com.au/home-loans/guides/what-types-of-home-loans-are-there-43635/

13. For securitization, see Crawford et al. (2013). For default rates see Canada Mortgage and Housing Corporation: Homeowners' debt at a glance dated June 13, 2017 (https://www.cmhc-schl.gc.ca/en/hoficlincl/observer/observer_145.cfm) and "How Canada is not like the United States" January 16, 2014|By

Michael Hiltzik (http://articles.latimes.com/2014/jan/16/business/la-fi-mh-canada-20140116).

14. See http://publications.gc.ca/collections/collection_2019/schl-cmhc/nh70-2/NH70-2-2019-3-eng.pdf; https://www.firstfoundation.ca/mortgage-glossary/conventional-mortgage/; or the Government of Canada's website https://www.canada.ca/en/financial-consumer-agency/services/mortgages/reduce-prepayment-penalties.html

15. See Zhou (2015)

16. See Moody's: Rising LTV ratios in Japanese RMBS https://www.moodys.com/research/Moodys-Rising-LTV-ratios-in-Japanese-RMBS-reflect-refinancing-not–PR_383677 and "Buying a Home in Japan: What interest rate can I get for a home mortgage loan in Japan?" June 8, 2017 By Jeff Wynkoop (https://resources.realestate.co.jp/buy/what-interest-rate-can-i-get-for-a-home-mortgage-loan-in-japan/)

17. See "The emerging mortgage market in Russia: an overview with local and foreign perspectives" by Olga Mashkina, Piia Heliste, and Riitta Kosonen (https://aaltodoc.aalto.fi/handle/123456789/11015) and https://www.expatica.com/ru/housing/Russian-real-estate-and-mortgages_758273.html

18. See https://www.reuters.com/article/korea-economy-household/s-korea-sets-new-fixed-rate-amortising-home-loan-rules-for-banks-idUSL3N0LW0Q520140227 and https://www.imf.org/external/pubs/ft/scr/2007/cr07345.pdf

19. See FHA MIRS Transition Index https://www.fhfa.gov/DataTools/Downloads/pages/monthly-interest-rate-data.aspx

20. See the Federal Housing Administration (FDA) at https://www.hud.gov/program_offices/housing/fhahistory

21. For additional information on VA mortgage policies see https://www.benefits.va.gov/homeloans/documents/docs/history.pdf. For a historical perspective of the VA see https://www.va.gov/opa/publications/archives/docs/history_in_brief.pdf.

22. For a historical perspective of each agency see: Ginnie Mae (https://www.ginniemae.gov/about_us/who_we_are/Pages/our_history.aspx); Fannie Mae (http://www.fanniemae.com/portal/about-fm/fannie-mae-history.html); and Freddie Mac (http://www.freddiemac.com/about/). For the statutory authority see "Government National Mortgage Association Statutory Authority": https://www.ginniemae.gov/about_us/what_we_do/Documents/statutes.pdf; "Federal National Mortgage Association Charter Act": http://www.fanniemae.com/resources/file/aboutus/pdf/fm-amended-charter.pdf; "Federal Home Loan Mortgage Corporation Act": http://www.freddiemac.com/governance/pdf/charter.pdf; and "Fannie Mae and Freddie Mac: What Happens and Where do We Go From Here?" https://democrats-oversight.house.gov/sites/democrats.oversight.house.gov/files/documents/Stanton%20Attachments.pdf.

23. See Lea and Sanders (2011)

24. See HUD 4155.1 Chapter 4, Section F, 2 Qualifying Ratios. Note a ratio exceeding 31% for Mortgage Payment Expense to Effective Income Ratio or 43% for Total Fixed Payment to Effective Income Ratio may be acceptable if significant compensating factors (HUD 4155.1 4.F.3) or for borrowers who qualify under FHA's Energy Efficient Homes (Ratio limit is 33% and 45% respectively for debt to income and total debt to income respectively).

25. For UFMIP and MIP fee structure see Appendix 1.0 Mortgage Insurance Premiums and for maximum mortgage amount Allowable mortgage parameters at https://www.hud.gov/sites/documents/40001HSGH.PDF (Handbook 4000.1 12/30/2016) Note there are special exceptions for Alaska, Hawaii, Guam, and the Virgin Islands. Also see https://www.hud.gov/program_offices/housing/fhahistory for FHA's history.

26. See endnote 22.

27. For example, the following quote from the Freddie Mac website helps to reinforce the fact that the existence of the 30-year FRM was and continues to be a function of the U.S. Government "quasi" guaranties.

How did we get from the short-term, adjustable rate mortgages of the past to the 30-year fixed rate mortgages of the present? Well, you can't give the credit to market forces or the entrepreneurial vision of financiers. The 30-year fixed rate mortgage owes its existence to government actions to remedy dislocations in the mortgage market. The process started during the Great Depression, when the federal government created the Home Owner's Loan Corporation (HOLC) to buy defaulted mortgages and reinstate them. HOLC transformed the original short-term, variable rate mortgages to more-affordable 20-year fixed-rate mortgages, the first step to what eventually became the fully-amortizing, 30-year fixed-rate mortgage that dominates mortgage lending today.

The considerable benefits of the 30-year fixed rate mortgage to consumers are beyond question.

However, this type of mortgage isn't a natural fit for lenders. All the features that benefit the consumer—long term, fixed interest rate, and the option to prepay the loan without penalty—create serious headaches for lenders. As a result, the federal government created Freddie Mac and other institutions that allow lenders to hand these headaches over to the capital markets, where sophisticated portfolio managers have the tools and expertise to manage the investment risks of the 30-year mortgage. Freddie Mac and its sister institutions make possible a steady, reliable flow of funds from capital markets to individual homebuyers even in periods of economic upheaval. And they make possible the low and stable payments and flexibility of the 30-year fixed rate mortgage. http://www.freddiemac.com/perspectives/sean_becketti/20170410_homebuyers_communities_fixed_mortgage.html

28. See "A Brief Analysis of Some Key Provisions of Title XIV of the Dodd-Frank Wall Street Reform and Consumer Protection Act" by Laura Greco (https://www.mcglinchey.com/A-Brief-Analysis-of-Some-Key-Provisions-of-Title-XIV-of-the-Dodd-Frank-Wall-Street-Reform-and-Consumer-Protection-Act-08-25-2010/)

29. No penalty for FHA mortgages (HUD 4155-2 (Chapter 3)). For a discussion on prepayment penalties see https://www.consumerfinance.gov/ask-cfpb/what-is-a-prepayment-penalty-en-1957/

30. See https://www.nolo.com/legal-encyclopedia/when-are-prepayment-penalties-allowed-new-mortgages.html for background on prepayment penalties.

31. A breakdown of mortgage inflows and outflows is shown in the Federal Reserve publication "Ins and Outs of Mortgage Debt: An Update—2015." https://www.federalreserve.gov/econresdata/notes/feds-notes/2015/the-ins-and-outs-of-mortgage-debt-an-update-20151207.html

32. See endnote 21.

33. See endnotes 21 and 29.

34. See https://www.irs.gov/pub/irs-pdf/p936.pdf for the 2017 home mortgage interest rate deduction (IRS Publication 936). The deductions limits are changed for 2018 and beyond.

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