Local Currency Housing Finance Instruments

adapted to High Inflation and/or Real Interest Rates

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Housing Finance Under High Inflation and Real Interest Rates

- The Tilt Effect – Why standard mortgage loan products are unaffordable under persistent high inflation or real rates
- Alternative local currency loan products deferring principal and / or interest payments
- Legal and regulatory issues with negative amortization products
- Which products to prefer if inflation is expected to fall?

Affordability and Inflation - Standard Mortgage Contracts

	Interest Rate		Inflation		Real Interest
Low inflation	5%	=	2%	+	3%
High inflation	15%	=	12%	+	3%

	January YEAR 1		
	House Price	Loan	Loan-to-Value
Low inflation	100	50	50%
High inflation	100	50	50%

Note: simplified Fisher equation.

Tilt Effect

Higher Inflation leads to Higher (Initial) Real Amortization in a Standard Mortgage Contract

	January YEAR 2			Real
	House Price	Loan*	Loan-to-Value	Amortization**
Low inflation	102	49	48.0%	2.0%
High inflation	112	49	43.8%	6.3%

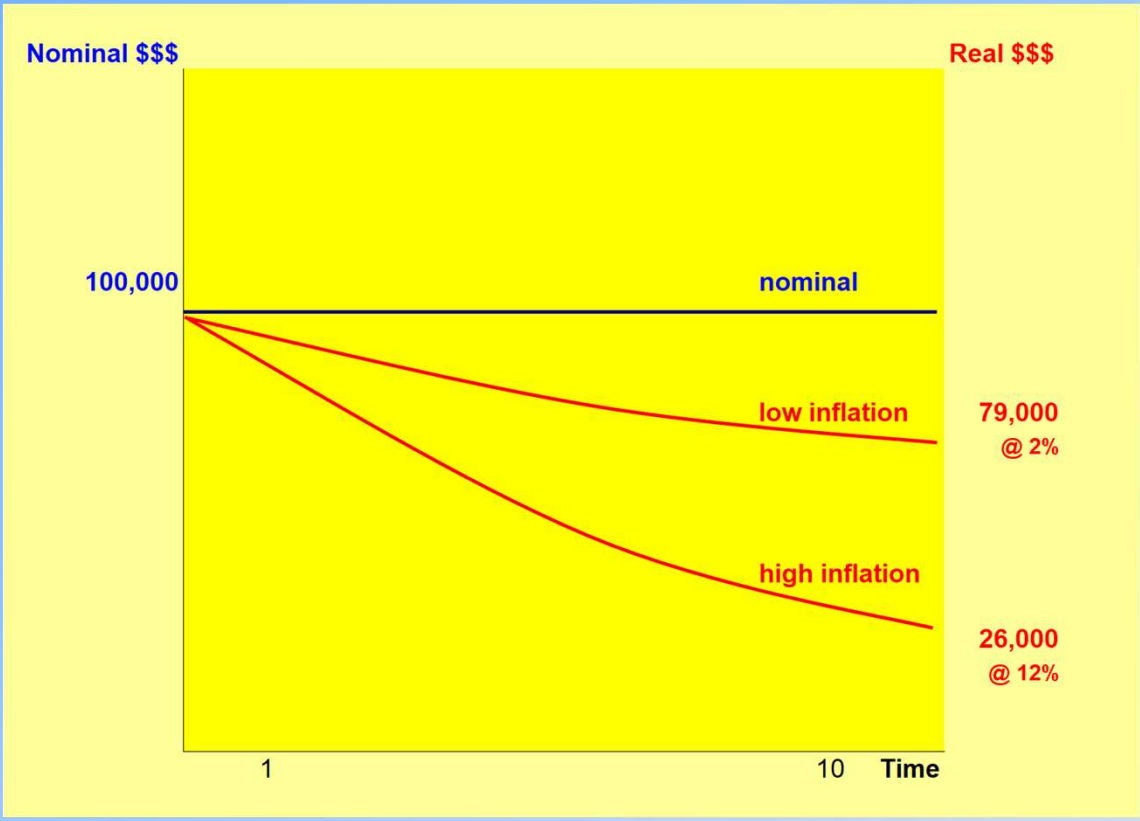
	Real Debt Service Paid in YEAR 1		
	Interest	Amortization	Total
Low inflation	3.0%	2.0%	5.0%
High inflation	3.0%	6.3%	9.3%

Whether the loan is adjustable-rate (ARM) or fixed-rate (FRM) will only change real interest (yield curve), not real amortization.
Both products are unaffordable under high inflation.

*Assumes 2% nominal amortization. ** 50% initial LTV minus current LTV

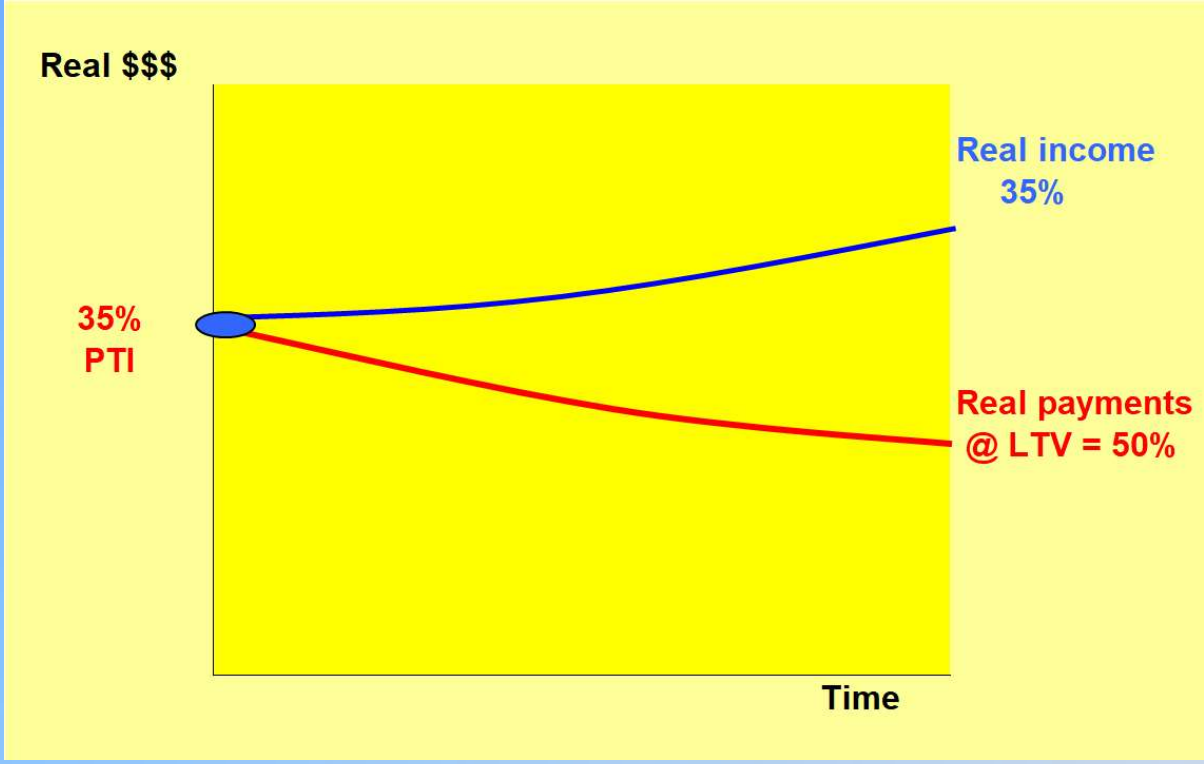
Tilt effect visualized

Loan Annuities and their Real Values at Different Inflation Levels



The higher the inflation rate, the more the real repayment profile of the housing finance is 'tilted' against the horizontal line (zero inflation)

Affordability – Example 1 Low Inflation



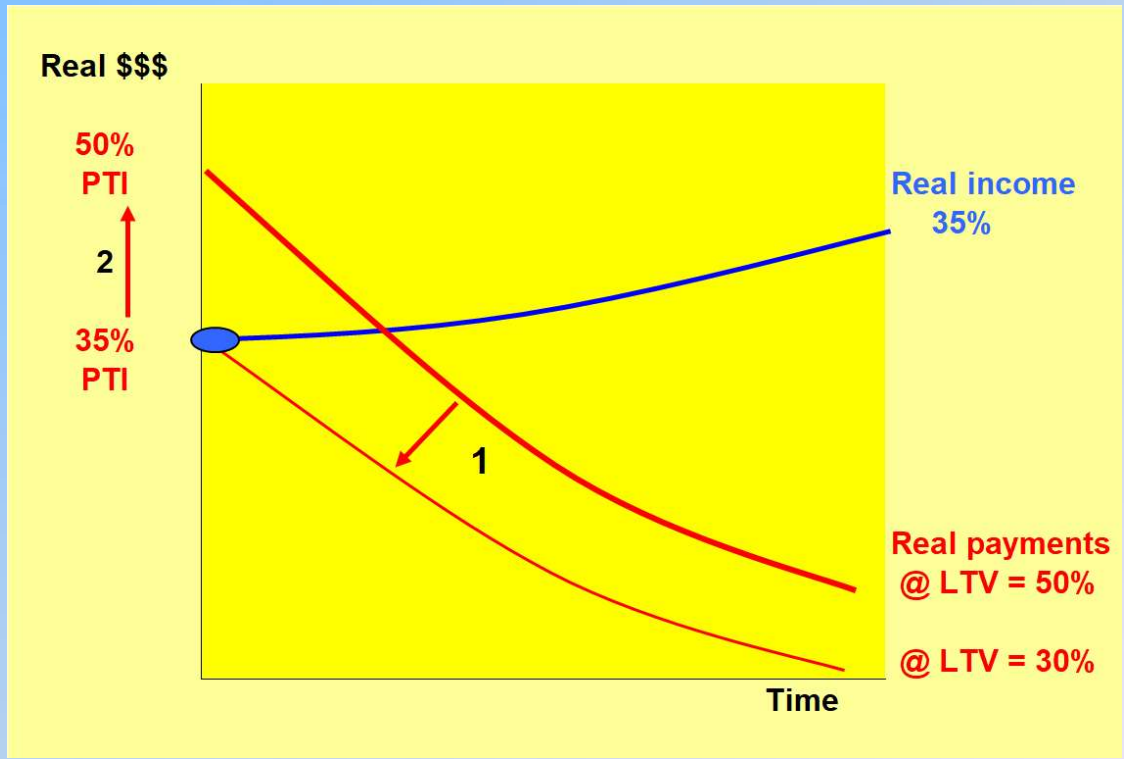
- Inflation level 5-10%
- Reasonably high LTV, e.g. 50%, is affordable
- Standard fixed-rate (FRM) or adjustable-rate (ARM) mortgage contract can be used.

Note: PTI – Payment-to-income ratio, LTV – Loan-to-value ratio

Affordability – Example 2 High Inflation

- An LTV of 50% becomes unaffordable
- Reason: high initial real amortization pushes up PTI.
- Standard ARM or FRM works only with:
  1. Higher equity requirements, e.g. reduce LTV to 30%
  2. Higher payment-to-income: e.g. increase to 50%; U.S., U.K. or Germany: 35% max.

→Both options are undesirable!



Radical Solution: Systematic Negative Amortization

For high inflation and nominal interest rate levels (e.g. >=15%)

- Slow down the decline of loan-to-value ratio to re-balance the real amortization profile
- E.g. by capitalizing the inflationary component of the nominal interest payments into the balance of the loan.
- Caution: loan must still be repaid within maturity!

Solution: Negative Amortization

	H Price January YEAR 1	Loan	H Price January YEAR 2	Loan	Nominal Amortization	Loan	Loan-to-Value	Real amortization	Real Debt Service*
Low infl	100	50	102	51	2%	50	49.0%	1.0%	4.0%
High infl	100	50	112	56	2%	55	49.0%	1.0%	4.0%

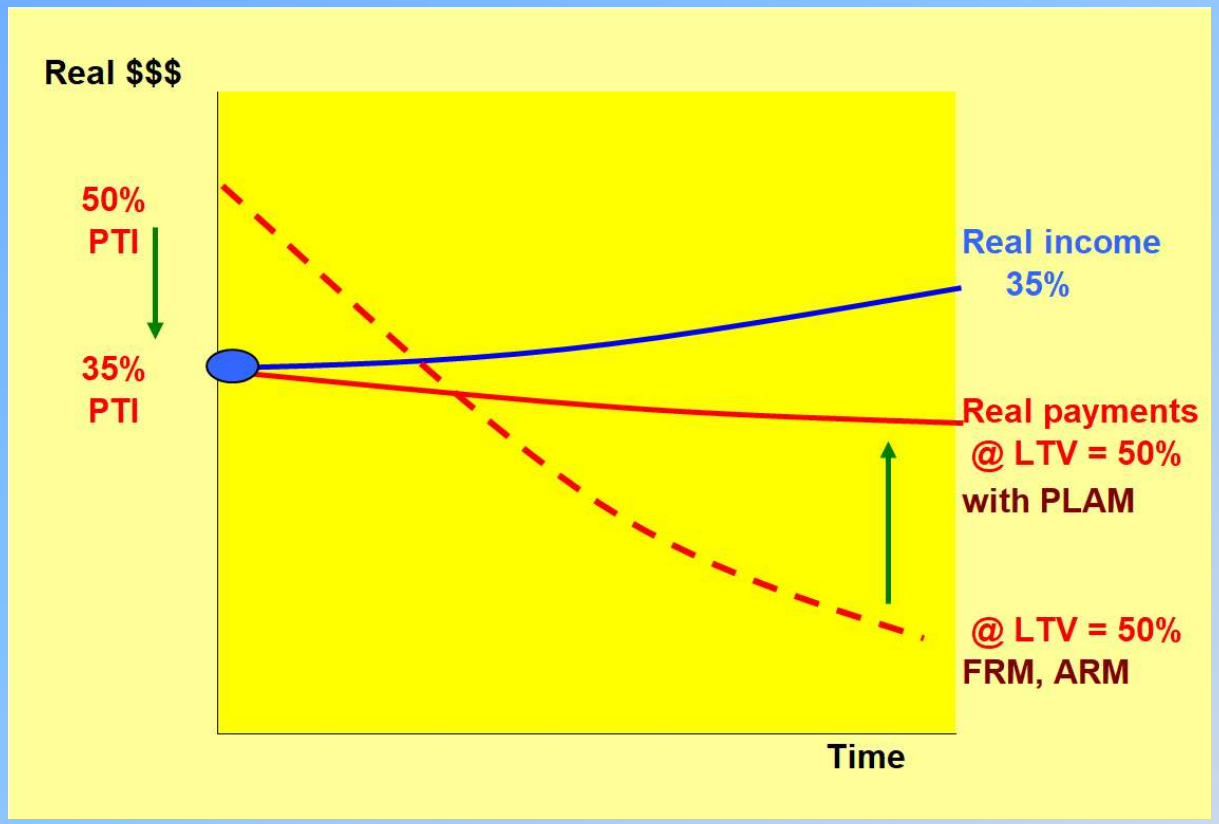
Year 1 under high inflation: LTV declines from 50% only to 49%, instead of to 43%; and real debt service is reduced from 9.3% to 4%.

Main product: Price Level Adjusted Mortgage (PLAM), details see below

Main alternative: FX (USD) mortgage with greater volatility risk in case of deviations of FX from purchasing power parity (e.g. covered interest rate arbitrage, speculation)

*Including 3% real return.

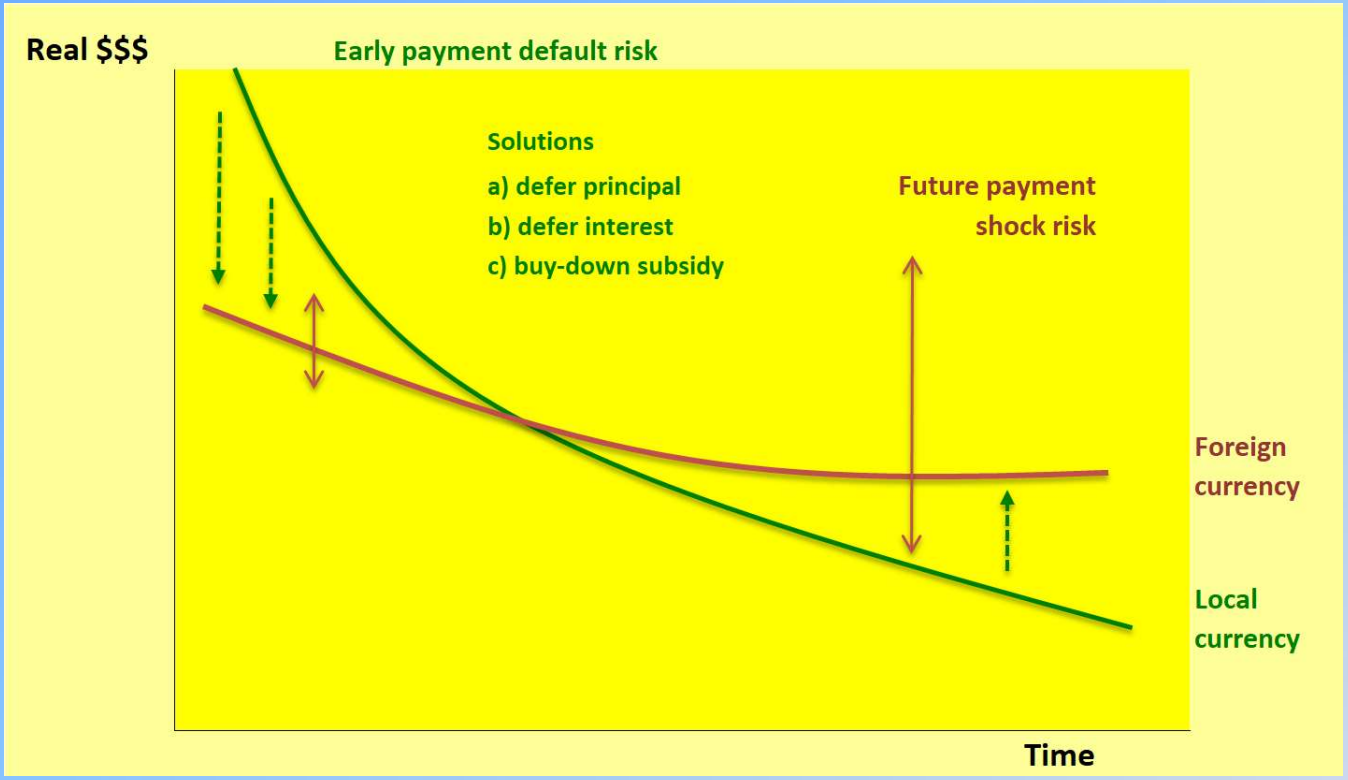
Tilt Correction with Negative Amortization Instrument



- PLAM: lender charges real interest rate over outstanding rising with inflation (+ regular amortization)
- Real payment profile flattens
- Initial LTV can be higher again.

Moderate Solutions: Defer or Buy Down Some Principal / Interest Payment

For moderate inflation and nominal interest rate levels (<15%)



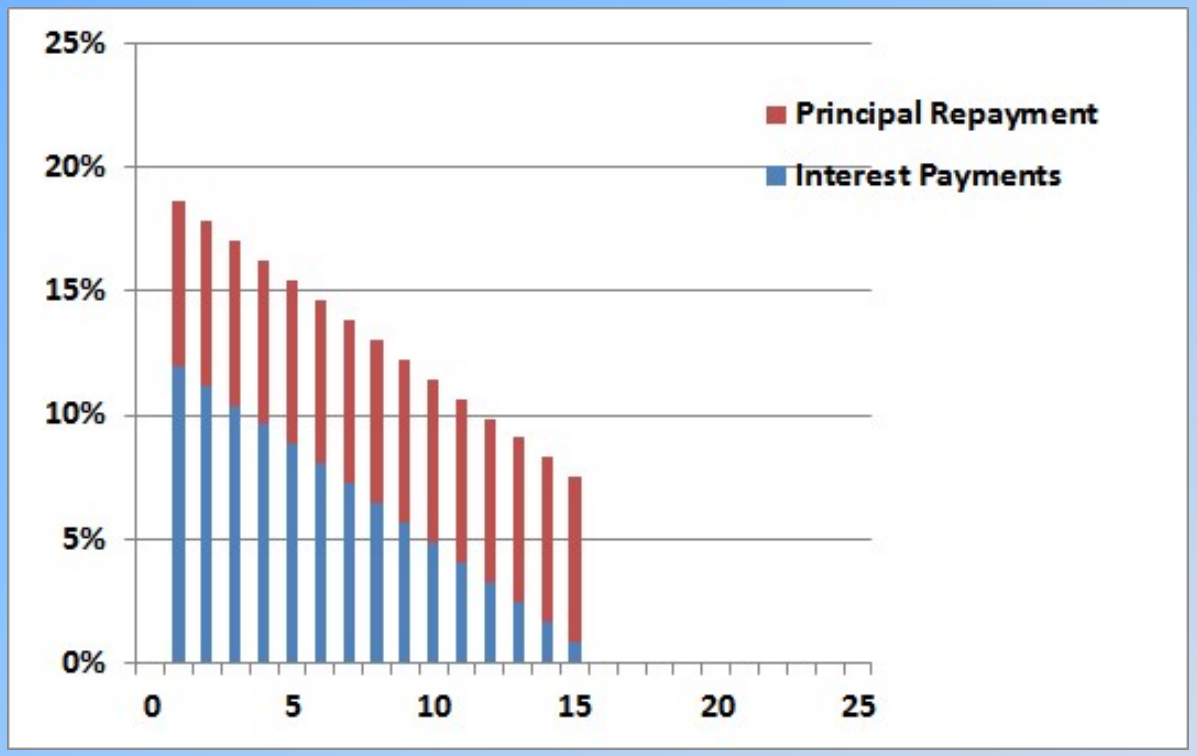
a) Defer principal: reduce initial principal payments or give grace periods
b) Defer interest: i.e. finance interest to be clawed back in later periods
May lead to modest negative amortization
Products: annuity mortgage, Graduated Payment Mortgage (GPM), interest loan
c) Buy down initial payments to an affordable level (decreases over time) = **subsidy (e.g. initially reduced interest rates)**

Moderate Solutions, Step by Step

- **Serial amortization mortgage**
- **Annuity mortgage**
- **Graduated payment mortgage**
- **Interest buydown**
- **Interest loan (second loan)**

Serial Amortization Mortgage

Principal repayment remains constant ('serial'), i.e. very high initial payment



For a **12%, 15 year loan** the initial principal payment under serial amortization is 6.7% taking the total initial payment to **18.7%**

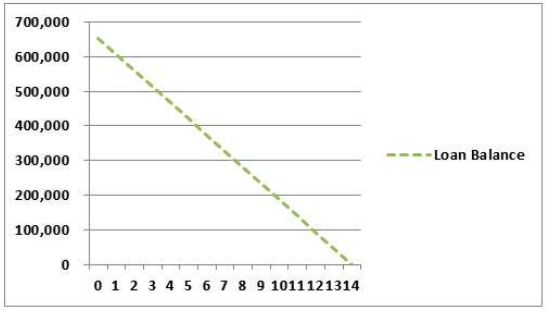
Serial amortization is preferred by lenders with limited access to long-term funding

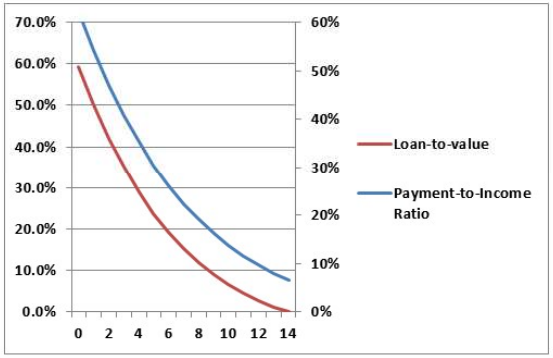
Serial Amortization Mortgage Mechanics

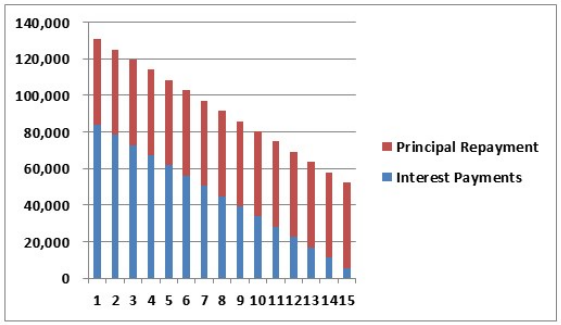
Fixed-Rate Mortgage (FRM), Serial

	Contract NOMINAL Payment level	Interest Payments 12.00% level	Loan Balance	Principal Repayment 6.67%	Payment-to-Income Ratio	REAL Real Service	Debt Real Balance	Loan	Risk Income	Loan-to-Income	Loan-to-value
	CU	CU	CU	CU	%	CU	CU				
0			700,000			(700,000)	700,000		200,000	3.50	70.0%
1	130,667	84,000	653,333	46,667	62.2%	124,444	622,222		210,000	3.11	59.4%
2	125,067	78,400	606,667	46,667	54.1%	113,439	550,265		231,000	2.63	50.1%
3	119,467	72,800	560,000	46,667	47.0%	103,200	483,749		254,100	2.20	42.1%
4	113,867	67,200	513,333	46,667	40.7%	93,678	422,321		279,510	1.84	35.1%
5	108,267	61,600	466,667	46,667	35.2%	84,830	365,646		307,461	1.52	29.0%
6	102,667	56,000	420,000	46,667	30.4%	76,611	313,410		338,207	1.24	23.7%
7	97,067	50,400	373,333	46,667	26.1%	68,983	265,321		372,028	1.00	19.2%
8	91,467	44,800	326,667	46,667	22.4%	61,908	221,101		409,231	0.80	15.2%
9	85,867	39,200	280,000	46,667	19.1%	55,350	180,490		450,154	0.62	11.9%
10	80,267	33,600	233,333	46,667	16.2%	49,277	143,246		495,169	0.47	9.0%
11	74,667	28,000	186,667	46,667	13.7%	43,656	109,140		544,686	0.34	6.5%
12	69,067	22,400	140,000	46,667	11.5%	38,459	77,957		599,155	0.23	4.5%
13	63,467	16,800	93,333	46,667	9.6%	33,658	49,497		659,070	0.14	2.7%
14	57,867	11,200	46,667	46,667	8.0%	29,227	23,570		724,977	0.06	1.2%
15	52,267	5,600	0	46,667	6.6%	25,141	0		797,475	0.00	0.0%
				Total real repayments		1,001,862				3.50	70.0%
				Internal real rate of return		6.67%				1.52	0.0%

**required to amortize loan in 15 years







Initial PTI 62%

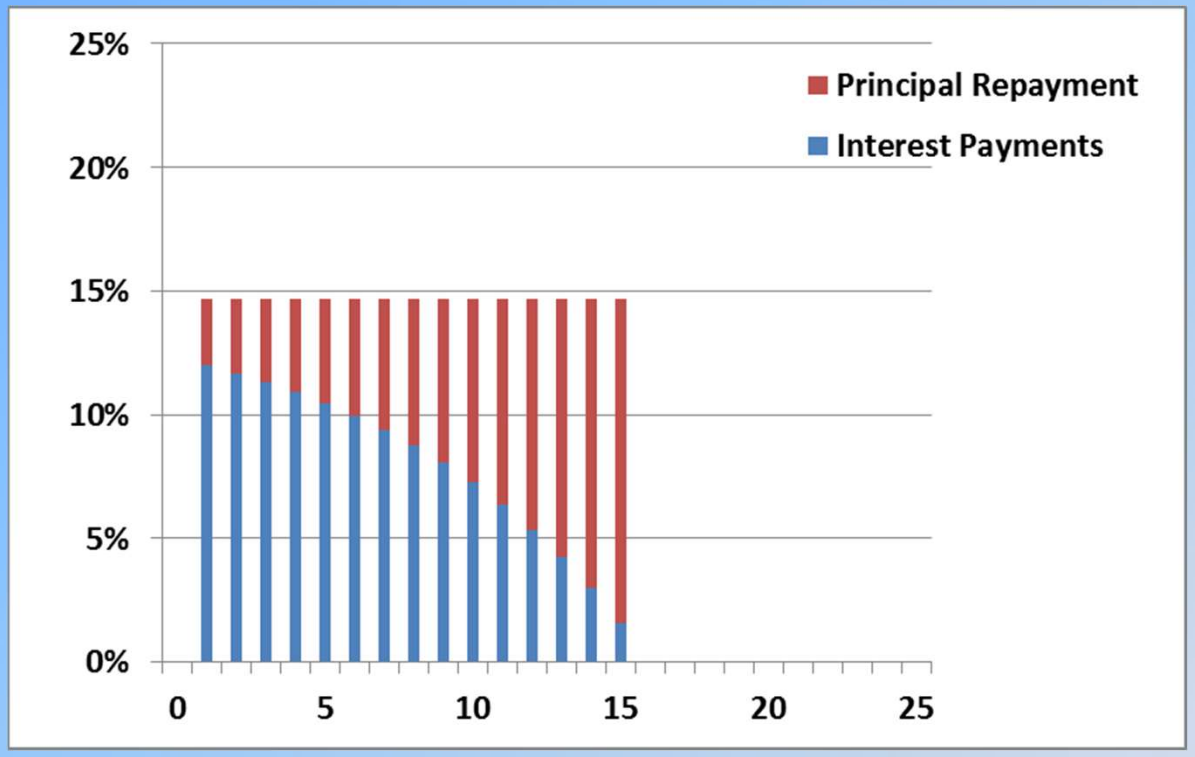
Initial principal payment 6.7%

Extreme initial PTI, unaffordable

Note: calculation assumes 10% income growth, argumentation is the same for lower growth rates

Annuity Mortgages are Already Deferring Some Principal

Principal repayment rises, but is initially always positive



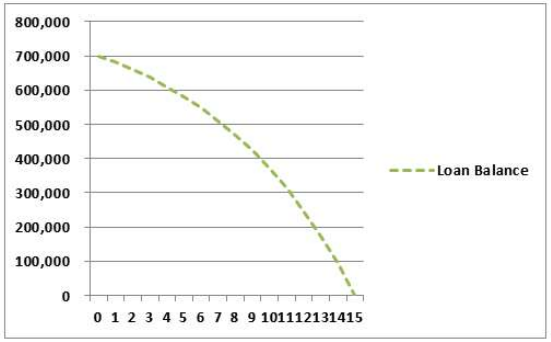
For a 12%, 15 year loan the initial principal payment is 2.7% taking the total initial payment to **14.7%**

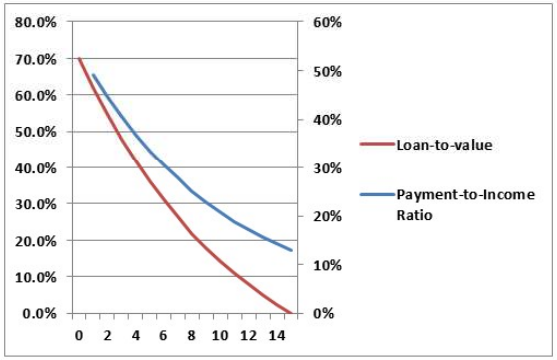
Annuity Mortgage Mechanics

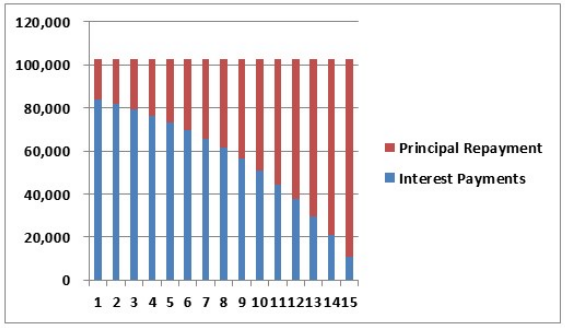
Fixed-Rate Mortgage (FRM), Self-amortizing

	Contract							Risk		
	NOMINAL Payment	Interest Payments	Loan Balance	Principal Repayment	Payment-to-Income Ratio	Real Service	REAL Debt Real Balance Loan	Income	Loan-to-Income	Loan-to-value
	14.70% level	**12.02%** level								
	CU	CU	CU	CU	%	CU	CU			
0			700,000			(700,000)	**700,000**	200,000	3.50	70.0%
1	102,900	84,161	681,261	18,739	**49.0%**	**98,000**	**648,820**	210,000	3.24	61.9%
2	102,900	81,908	660,269	20,992	**44.5%**	**93,333**	**598,883**	231,000	2.86	54.6%
3	102,900	79,384	636,753	23,516	**40.5%**	**88,889**	**550,051**	254,100	2.51	47.8%
4	102,900	76,557	610,410	26,343	**36.8%**	**84,656**	**502,186**	279,510	2.18	41.7%
5	102,900	73,390	580,900	29,510	**33.5%**	**80,625**	**455,150**	307,461	1.89	36.1%
6	102,900	69,842	547,841	33,058	**30.4%**	**76,786**	**408,807**	338,207	1.62	30.9%
7	102,900	65,867	510,808	37,033	**27.7%**	**73,129**	**363,022**	372,028	1.37	26.2%
8	102,900	61,414	469,323	41,486	**25.1%**	**69,647**	**317,656**	409,231	1.15	21.9%
9	102,900	56,427	422,849	46,473	**22.9%**	**66,330**	**272,572**	450,154	0.94	17.9%
10	102,900	50,839	370,788	52,061	**20.8%**	**63,172**	**227,632**	495,169	0.75	14.3%
11	102,900	44,580	312,468	58,320	**18.9%**	**60,163**	**182,694**	544,686	0.57	11.0%
12	102,900	37,568	247,136	65,332	**17.2%**	**57,299**	**137,615**	599,155	0.41	7.9%
13	102,900	29,713	173,949	73,187	**15.6%**	**54,570**	**92,249**	659,070	0.26	5.0%
14	102,900	20,914	91,963	81,986	**14.2%**	**51,971**	**46,448**	724,977	0.13	2.4%
15	102,900	11,057	120	91,843	**12.9%**	**49,497**	**58**	797,475	0.00	0.0%
					Total real repayments	1,068,067			3.50	70.0%
					Internal real rate of return	**6.69%**			1.89	0.0%

**required to amortize loan in 15 years







Initial PTI 49%

Initial principal payment

Critically high initial PTI, outlawed by most regulations

Graduated Payment Mortgage (GPM)

- Idea: defer principal or interest in a systematic fashion

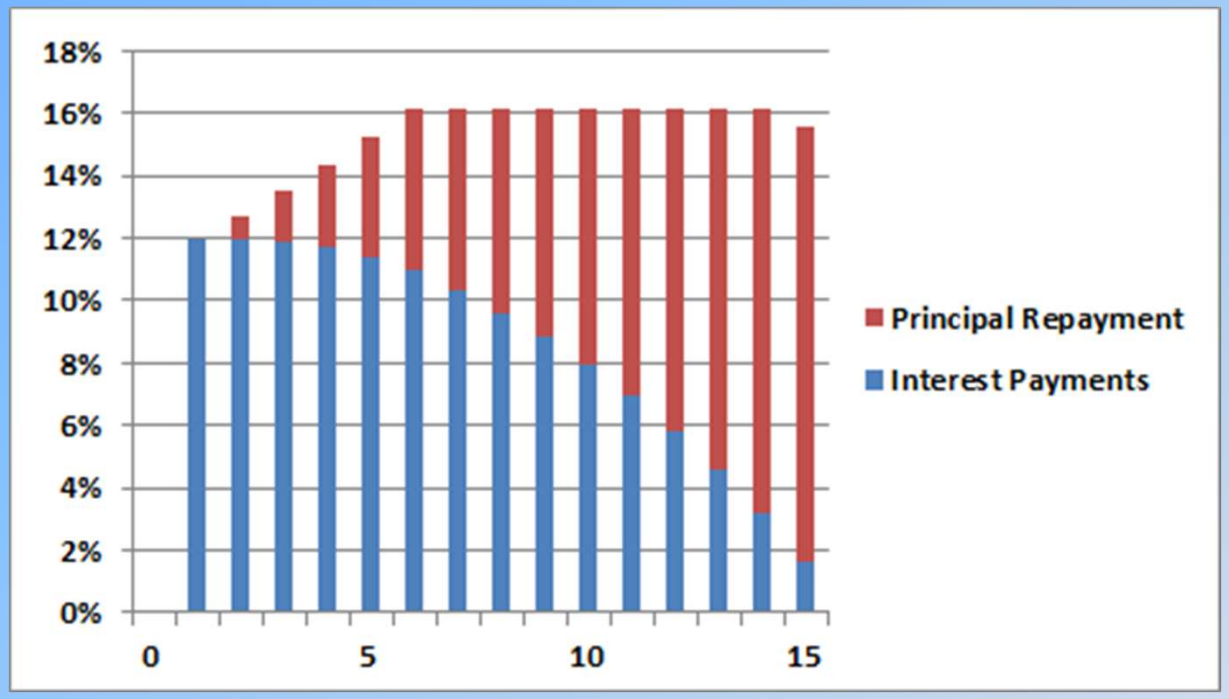
- Mechanics:
  - Set initial payment according to affordability, e.g. PTI = 40%
  - Grow payments P_t with growth rate g_t in a predetermined fashion over the initial K years of the loan: $P_t = (1+g_t)*P_{t-1}$

    Payment growth can also be stepwise
  - Compare payments with the nominal interest payment required: i_t*L_t. If $P_t < i_t*L_t$, add difference to principal: $L_{t+1} = L_t - (P_t - i_t*L_t)$
  - After some time (K) $P_K > i_K*L_K$ the loan starts to amortize ("recast") as a standard annuity loan.

- Notes:
  - Loans with initial grace periods are a variant,
  - GPMs do not necessarily capitalize interest payments.

Graduated Payment Mortgage

Lower initial payment to achieve a target PTI, recast the loan after period K to fully amortize



For a **12%, 15 year loan** the initial principal payment under the GPM in *one possible variant* is 0% taking the total initial payment to **12%**

The payment rate after the recast is 16.2% >> annuity mortgage payment rate of 14.7%

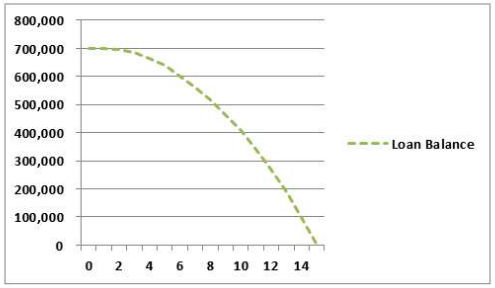
GPM Mechanics

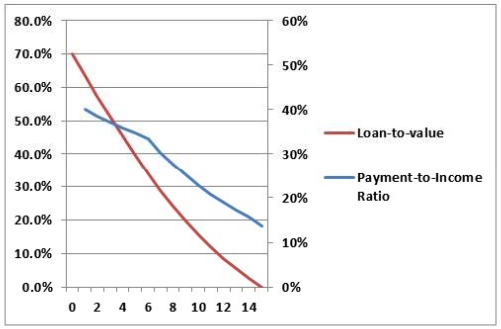
Graduated Payment Mortgage (GPM)

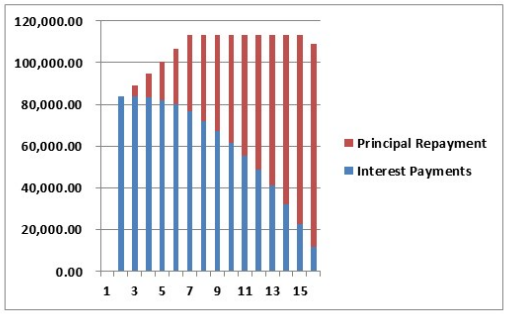
	Contract NOMINAL Payment	Interest Payments	Loan Balance	Principal Repayment	Payment-to-Income Ratio	REAL Real Service	Debt Real Balance	Loan	Risk Income	Loan-to-Income	Loan-to-value
	12.00%		4		40.00%						
	CU	CU	CU	CU	%	CU	CU				
0			700,000			(700,000)	700,000		200,000	3.50	70.0%
1	84,000	84,000	700,000	0	40.0%	80,000	666,667		210,000	3.33	63.6%
2	89,166	84,000	694,834	5,166	38.6%	80,876	630,235		231,000	3.01	57.4%
3	94,650	83,380	683,564	11,270	37.2%	81,762	590,489		254,100	2.69	51.4%
4	100,471	82,028	665,121	18,443	35.9%	82,657	547,197		279,510	2.38	45.4%
5	106,650	79,815	638,286	26,835	34.7%	83,563	500,114		307,461	2.08	39.6%
6	113,209	76,594	601,672	36,614	33.5%	84,478	448,977		338,207	1.78	34.0%
7	113,209	72,201	560,664	41,008	30.4%	80,455	398,454		372,028	1.51	28.8%
8	113,209	67,280	514,735	45,929	27.7%	76,624	348,393		409,231	1.26	24.0%
9	113,209	61,768	463,295	51,440	25.1%	72,975	298,644		450,154	1.03	19.6%
10	113,209	55,595	405,682	57,613	22.9%	69,500	249,054		495,169	0.82	15.6%
11	113,209	48,682	341,155	64,527	20.8%	66,191	199,466		544,686	0.63	12.0%
12	113,209	40,939	268,885	72,270	18.9%	63,039	149,725		599,155	0.45	8.6%
13	113,209	32,266	187,943	80,942	17.2%	60,037	99,670		659,070	0.29	5.4%
14	113,209	22,553	97,288	90,655	15.6%	57,178	49,137		724,977	0.13	2.6%
15	108,962	11,675	0	97,288	13.7%	52,413	0		797,475	0.00	0.0%
					Total real repayments	1,091,748				3.50	70.0%
					Internal real rate of return	**6.67%**				2.08	0.0%

**required to amortize loan in 15 years

Graduation parameters	
Initial years	5 Years 6-16
6.15%	0.00%







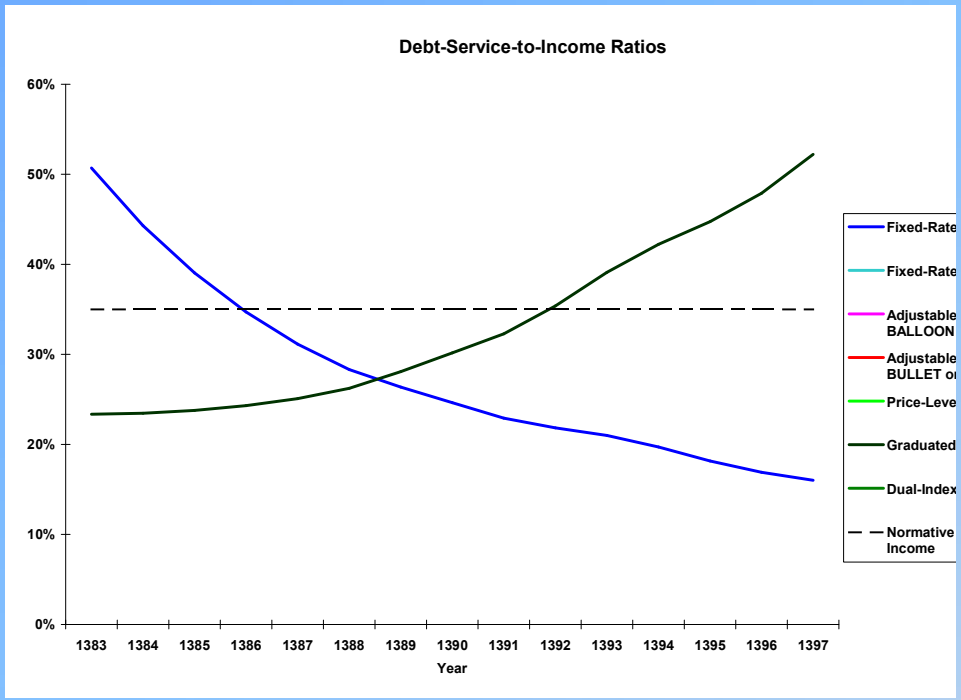
Initial PTI 40%

No initial principal payment, however, the PTI is still falling over time

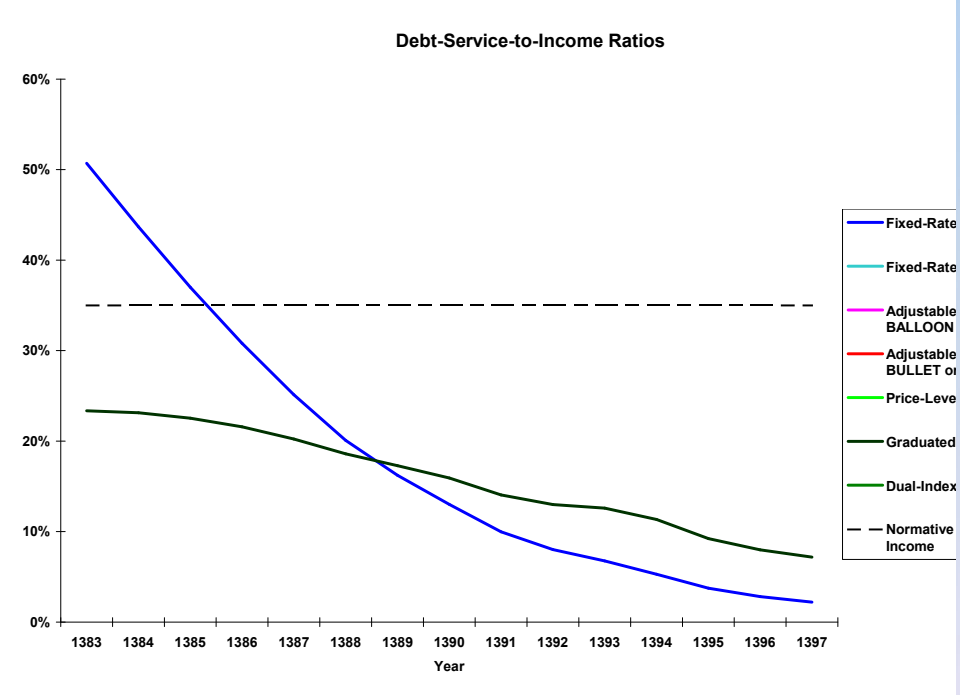
Loan balance will increase (negative amortization) in case of lower initial PTI

GPM Risks – (Wage) Inflation Mismatch and Real Return Risks

PTI when inflation declines



.. when inflation increases



Assumption: loan amortizes, i.e. full recast after K years

If inflation declines, real payments increase and the profitability of the loan increases

If inflation increases, real payments decrease and the profitability of the loan decreases

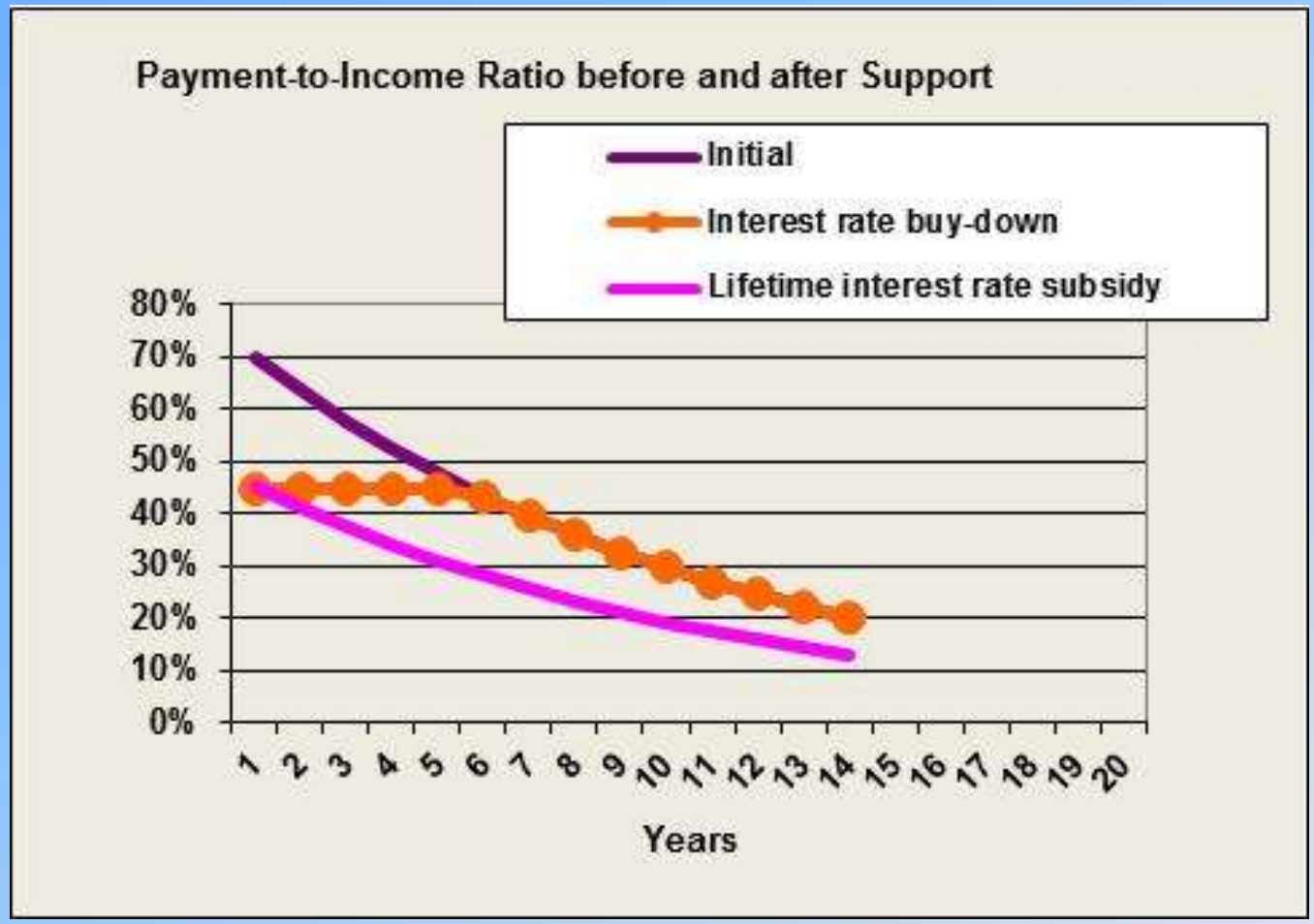
→GPM works best if inflation (nominal income growth) is within a predictable range, e.g. 5-10%

Graduated Payment Mortgage (GPM)

- Advantages
  - Borrower avoids Tilt problem, nominal debt burden changes predictably.
- Disadvantages
  - Lender bears inflation risk. If inflation drops, borrower will be highly overcharged; if inflation rises, bank will receive lower return.

    Not much different from FRM, but potentially more dangerous since more payments are in the future.
  - The loan may not amortize unless fully recast at time K, which may prompt a payment spike if graduation parameters are set too low.
- Option: combine GPM with reset fixed-rate mortgage permitting for pricing adjustment every few years →see below

Buy-Down Subsidy for FRM, Variant of GPM



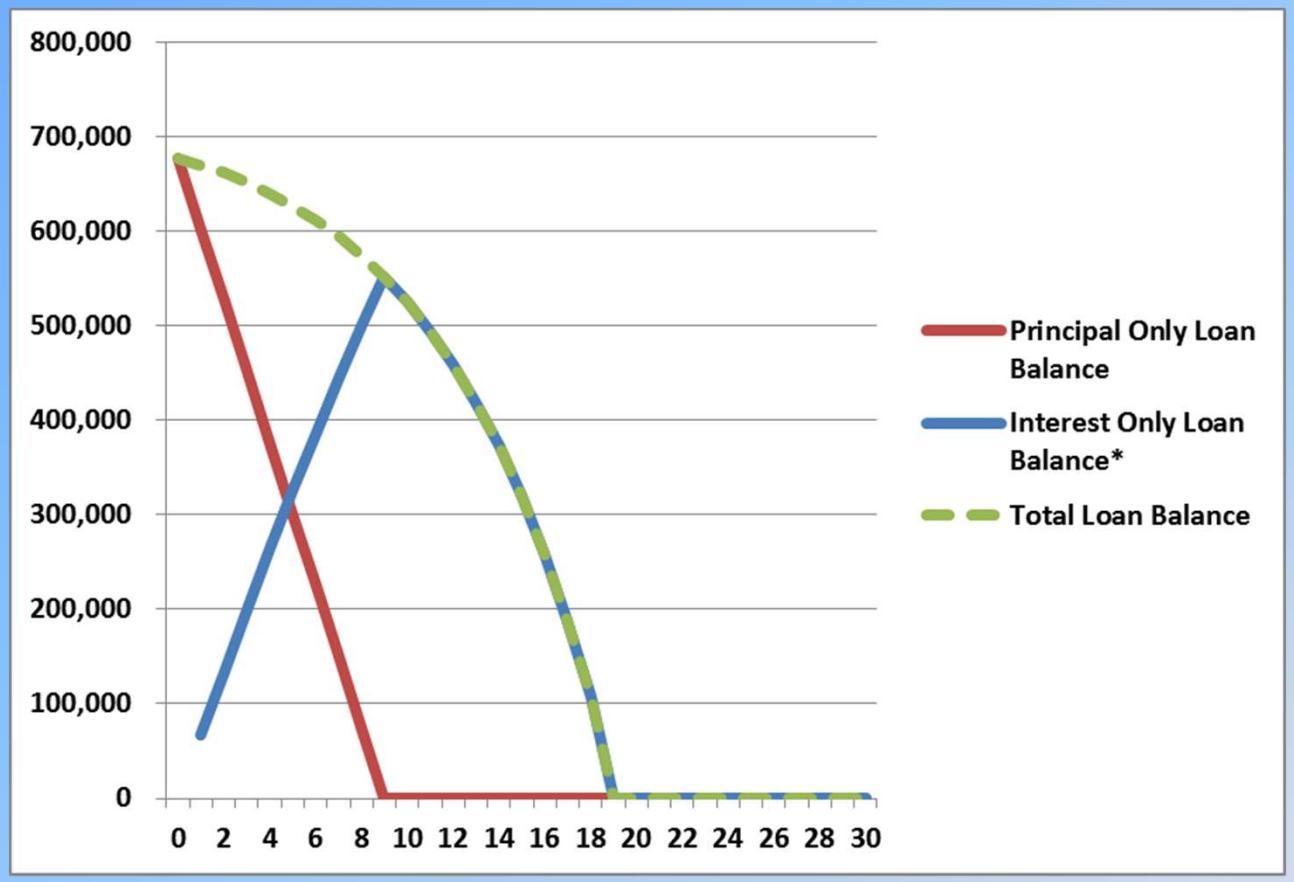
Lifetime interest rate subsidies are extremely wasteful !! →focus subsidies on initial phase of high PTI ratios.

The effect of a buy-down is a payment graduation.

(Second) Interest Loan

- Idea: finance the interest due to the bank with a second loan provided by an agency / subsidy sponsor
- Mechanics:
  - Capitalize all or some of the interest payments to reduce initial payments into a second loan
  - Amortize principal of bank loan as usual (serial or annuity); serial amortization reduces interest to be capitalized !
  - Amortize interest loan not or partially, but latest when the principal loan is amortized fully. Parameters can be adjusted to the desired initial PTI level.
  - Payment profile results in an annuity mortgage with extended maturity.

Interest Loan



Short-term principal-only loan whose interest is capitalized into an interest-only loan.

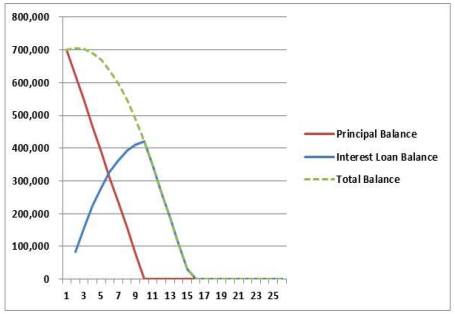
Commercial banks & agencies = 2 lenders.

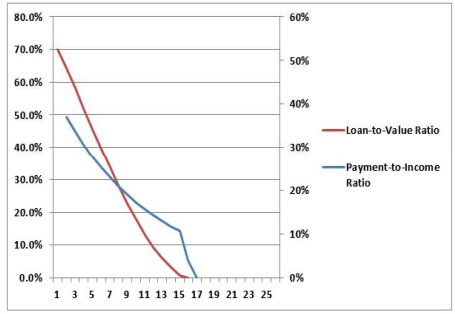
Interest Loan Detail

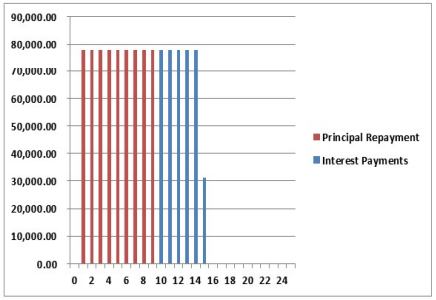
PO/IO (IPH Lebanon), 'Aufwendungsdarlehen' (interest loan)

	Contract									Debt			REAL	Loan		Risk		
	Annuity (r	Interest Payment Borrower	Interest Due Bank	Interest to Balance	Loan NOMINAL Principal Balance	Total Balance	Principal Repayment Borrower	Total Payment	Payment-to-Income Ratio	Real Service	PO only	IO only	Real Balance	PO only	IO only	Income	Loan-to-Income	Loan-to-Value Ratio
	11.11%		12.00%	0.00%														
	9 Years		PO loan rate	IO loan rate														
	CU	CU	CU	CU	CU		CU		%	CU	CU	CU	CU	CU	CU			
0					700,000	700,000				(700,000)	(700,000)	0	700,000	700,000	0	200,000	3.50	70.0%
1	77,778	0	84,000	84,000	622,222	706,222	77,778	77,778	37.0%	74,074	154,074	0	672,593	592,593	80,000	210,000	3.36	64.2%
2	77,778	0	74,667	158,667	544,444	703,111	77,778	77,778	33.7%	70,547	138,272	0	637,743	493,827	143,915	231,000	3.04	58.1%
3	77,778	0	65,333	224,000	466,667	690,667	77,778	77,778	30.6%	67,187	123,625	0	596,624	403,124	193,500	254,100	2.72	51.9%
4	77,778	0	56,000	280,000	388,889	668,889	77,778	77,778	27.8%	63,988	110,059	0	550,297	319,940	230,357	279,510	2.39	45.7%
5	77,778	0	46,667	326,667	311,111	637,778	77,778	77,778	25.3%	60,941	97,505	0	499,716	243,764	255,952	307,461	2.07	39.6%
6	77,778	0	37,333	364,000	233,333	597,333	77,778	77,778	23.0%	58,039	85,898	0	445,739	174,117	271,622	338,207	1.77	33.7%
7	77,778	0	28,000	392,000	155,556	547,556	77,778	77,778	20.9%	55,275	75,174	0	389,138	110,550	278,587	372,028	1.47	28.1%
8	77,778	0	18,667	410,667	77,778	488,444	77,778	77,778	19.0%	52,643	65,277	0	330,598	52,643	277,955	409,231	1.19	22.8%
9	77,778	0	9,333	420,000	0	420,000	77,778	77,778	17.3%	50,136	56,153	0	270,736	0	270,736	450,154	0.93	17.8%
10	77,778	77,778	0	342,222	0	342,222	0	77,778	15.7%	47,749	0	47,749	210,095	0	210,095	495,169	0.69	13.2%
11	77,778	77,778	0	264,444	0	264,444	0	77,778	14.3%	45,475	0	45,475	154,615	0	154,615	544,686	0.49	9.3%
12	77,778	77,778	0	186,667	0	186,667	0	77,778	13.0%	43,310	0	43,310	103,943	0	103,943	599,155	0.31	5.9%
13	77,778	77,778	0	108,889	0	108,889	0	77,778	11.8%	41,247	0	41,247	57,746	0	57,746	659,070	0.17	3.2%
14	77,778	77,778	0	31,111	0	31,111	0	77,778	10.7%	39,283	0	39,283	15,713	0	15,713	724,977	0.04	0.8%
15	77,778	31,111	0	0	0	0	0	31,111	3.9%	14,965	0	14,965	0	0	0	797,475	0.00	0.0%
16	0	0	0	0	0	0	0	0	0.0%	0	0	0	0	0	0	#NV	#NV	#NV
17	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
18	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
19	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
20	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
21	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
22	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
23	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
24	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
25	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
								Total real repayments		784,859							3.50	70.0%
								Internal real rate of return		1.72%	6.67%	#ZAHL!					2.07	0.0%

*with interest on interest







Initial PTI 37%

Total principal balance increases slightly, planned

Works in the same way with annuity loans

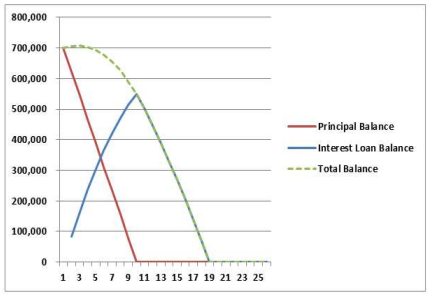
(but annuity loans mean higher interest loan volumes to be financed)

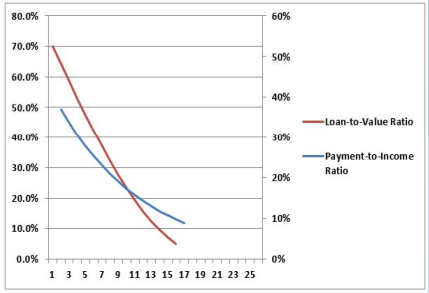
With Interest on Interest Loan

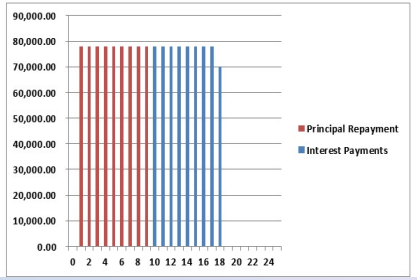
PO/IO (IPH Lebanon), 'Aufwendungsdarlehen' (interest loan)

	Contract									Debt						Risk		
	Annuity (r	Interest Payment Borrower	Interest Due Bank	Interest Loan to Balance	NOMINAL Principal Balance	Total Balance	Principal Repayment Borrower	Total Payment	Payment-to-Income Ratio	Real Service	PO only	IO only	REAL Real Balance	Loan PO only	Loan IO only	Income	Loan-to-Income	Loan-to-Value Ratio
	11.11%		12.00%	5.00%														
	9	Years	PO loan rate	IO loan rate														
	CU	CU	CU	CU	CU		CU		%	CU	CU	CU	CU	CU	CU			
0					700,000	700,000				(700,000)	(700,000)	0	700,000	700,000	0	200,000	3.50	70.0%
1	77,778	0	84,000	84,000	622,222	706,222	77,778	77,778	37.0%	74,074	154,074	0	672,593	592,593	80,000	210,000	3.36	64.2%
2	77,778	0	74,667	162,867	544,444	707,311	77,778	77,778	33.7%	70,547	138,272	0	641,552	493,827	147,725	231,000	3.06	58.5%
3	77,778	0	65,333	236,343	466,667	703,010	77,778	77,778	30.6%	67,187	123,625	0	607,286	403,124	204,162	254,100	2.77	52.8%
4	77,778	0	56,000	304,161	388,889	693,049	77,778	77,778	27.8%	63,988	110,059	0	570,173	319,940	250,234	279,510	2.48	47.3%
5	77,778	0	46,667	366,035	311,111	677,146	77,778	77,778	25.3%	60,941	97,505	0	530,562	243,764	286,798	307,461	2.20	42.0%
6	77,778	0	37,333	421,670	233,333	655,004	77,778	77,778	23.0%	58,039	85,898	0	488,774	174,117	314,657	338,207	1.94	37.0%
7	77,778	0	28,000	470,754	155,556	626,309	77,778	77,778	20.9%	55,275	75,174	0	445,106	110,550	334,556	372,028	1.68	32.1%
8	77,778	0	18,667	512,958	77,778	590,736	77,778	77,778	19.0%	52,643	65,277	0	399,833	52,643	347,190	409,231	1.44	27.6%
9	77,778	0	9,333	547,939	0	547,939	77,778	77,778	17.3%	50,136	56,153	0	353,207	0	353,207	450,154	1.22	23.2%
10	77,778	77,778	0	497,559	0	497,559	0	77,778	15.7%	47,749	0	47,749	305,458	0	305,458	495,169	1.00	19.2%
11	77,778	77,778	0	444,659	0	444,659	0	77,778	14.3%	45,475	0	45,475	259,983	0	259,983	544,686	0.82	15.6%
12	77,778	77,778	0	389,114	0	389,114	0	77,778	13.0%	43,310	0	43,310	216,673	0	216,673	599,155	0.65	12.4%
13	77,778	77,778	0	330,792	0	330,792	0	77,778	11.8%	41,247	0	41,247	175,426	0	175,426	659,070	0.50	9.6%
14	77,778	77,778	0	269,554	0	269,554	0	77,778	10.7%	39,283	0	39,283	136,143	0	136,143	724,977	0.37	7.1%
15	77,778	77,778	0	205,254	0	205,254	0	77,778	9.8%	37,412	0	37,412	98,730	0	98,730	797,475	0.26	4.9%
16	77,778	77,778	0	137,738	0	137,738	0	77,778	8.9%	35,631	0	35,631	63,100	0	63,100	#NV	#NV	#NV
17	77,778	77,778	0	66,848	0	66,848	0	77,778	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
18	77,778	70,190	0	0	0	0	0	70,190	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
19	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
20	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
21	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
22	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
23	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
24	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
25	0	0	0	0	0	0	0	0	#NV	#NV	#DIV/0!	#DIV/0!	#NV	#NV	#NV	#NV	#NV	#NV
								Total real repayments		807,307							3.50	70.0%
								Internal real rate of return		2.09%	6.67%	#ZAHL!					2.20	4.9%

*with interest on interest







Same initial PTI, result is longer maturity

Can interest be charged for the interest loan?
How concessionary is the funding provided by the agency?

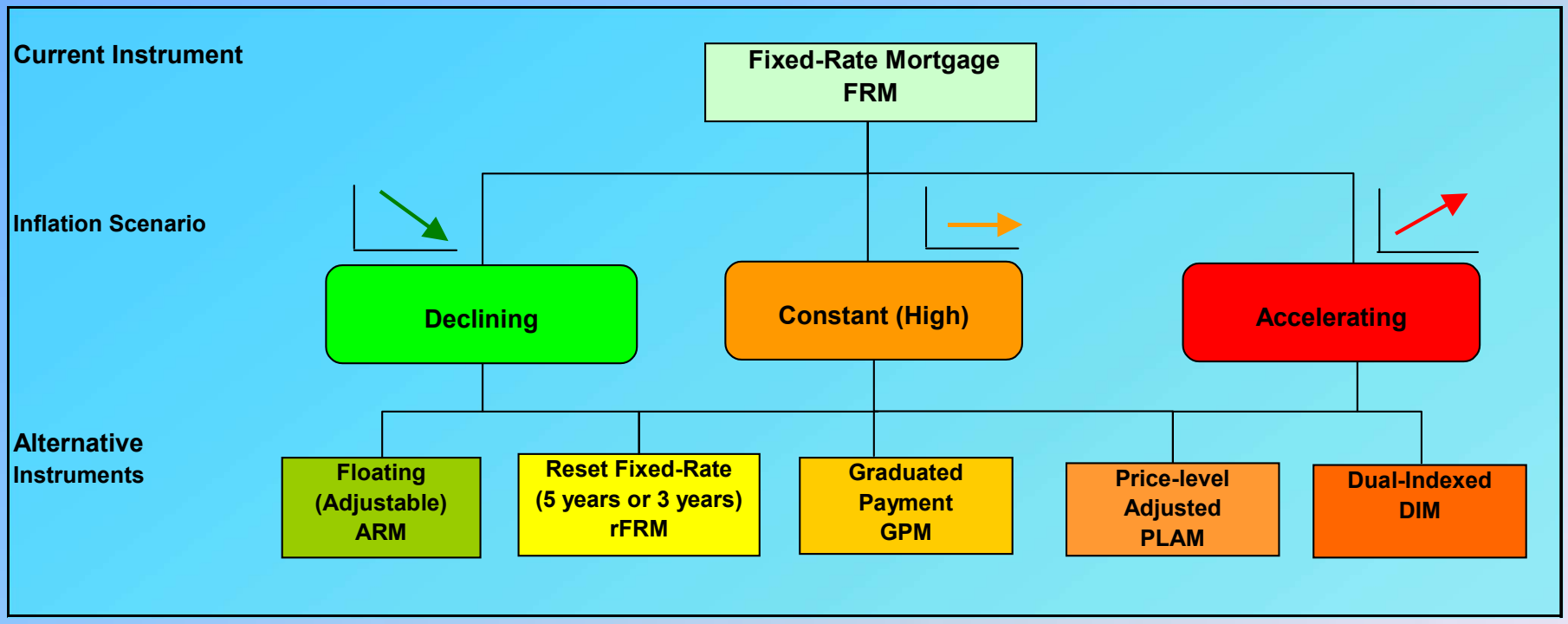
(Second) Interest Loan

- Advantages
  - Banks prefer serial loans that permit them to reduce interest rate risk
  - Borrower avoids Tilt problem, nominal debt burden changes predictably.
  - Loan always amortizes.
- Disadvantages
  - Interest loan lender bears considerable inflation / real interest rate risk.
  - Interest on interest may be prohibited, turning much (but not all) of the interest loan into a subsidy.

Consumer Protection / Financial Regulation Questions

- What if interest rates remain above 15% ?
  Are price-level-adjusted mortgages an option?
  Is reforming FX mortgages an option?
- Avoiding non-amortizing products, uncontrolled maturity extensions
- Limits to negative amortization
- Loan-to-value and payment-to-income policies conmensurate with risk
- Interest on interest

Local Currency Mortgage Product Selector, by Inflation Scenario



Price-Level Adjusted Mortgage (PLAM)

- Idea: secure fixed REAL return for the lender, in local currency
- Mechanics:
  - Adjust outstanding, L, with inflation index, π, periodically:
    $L_{t+1} = (1+\pi_t)*L_t - A_t$
  - Charge fixed 'real' rate of return, r, over adjusted balances:
    $P_t = r*L_t + A_t$
  - Recalculate amortization A_t after every period, to secure that loan fully amortizes (serial)
- Advantages
  - Lender secures fixed real return, loan always amortizes,
  - Borrower avoids Tilt problem
- Disadvantages
  - Borrower bears real income risk
  - Funding problems, depending on the degree to which the capital market is indexed.

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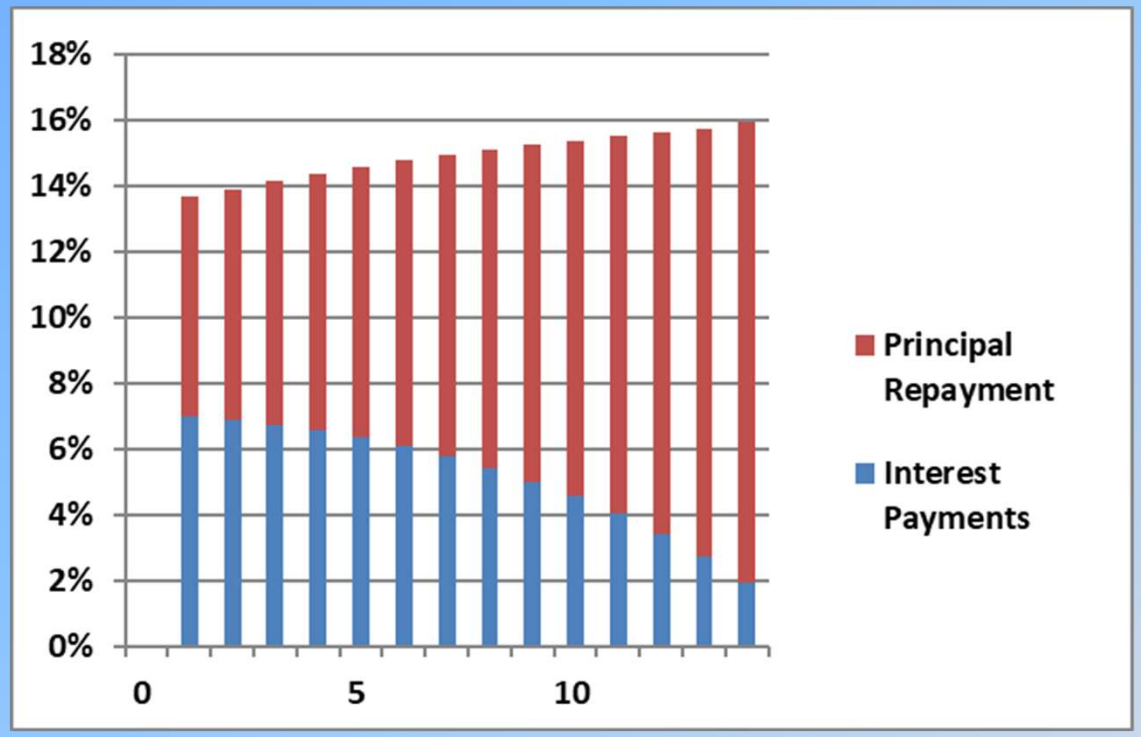
Price-Level Adjusted Mortgage

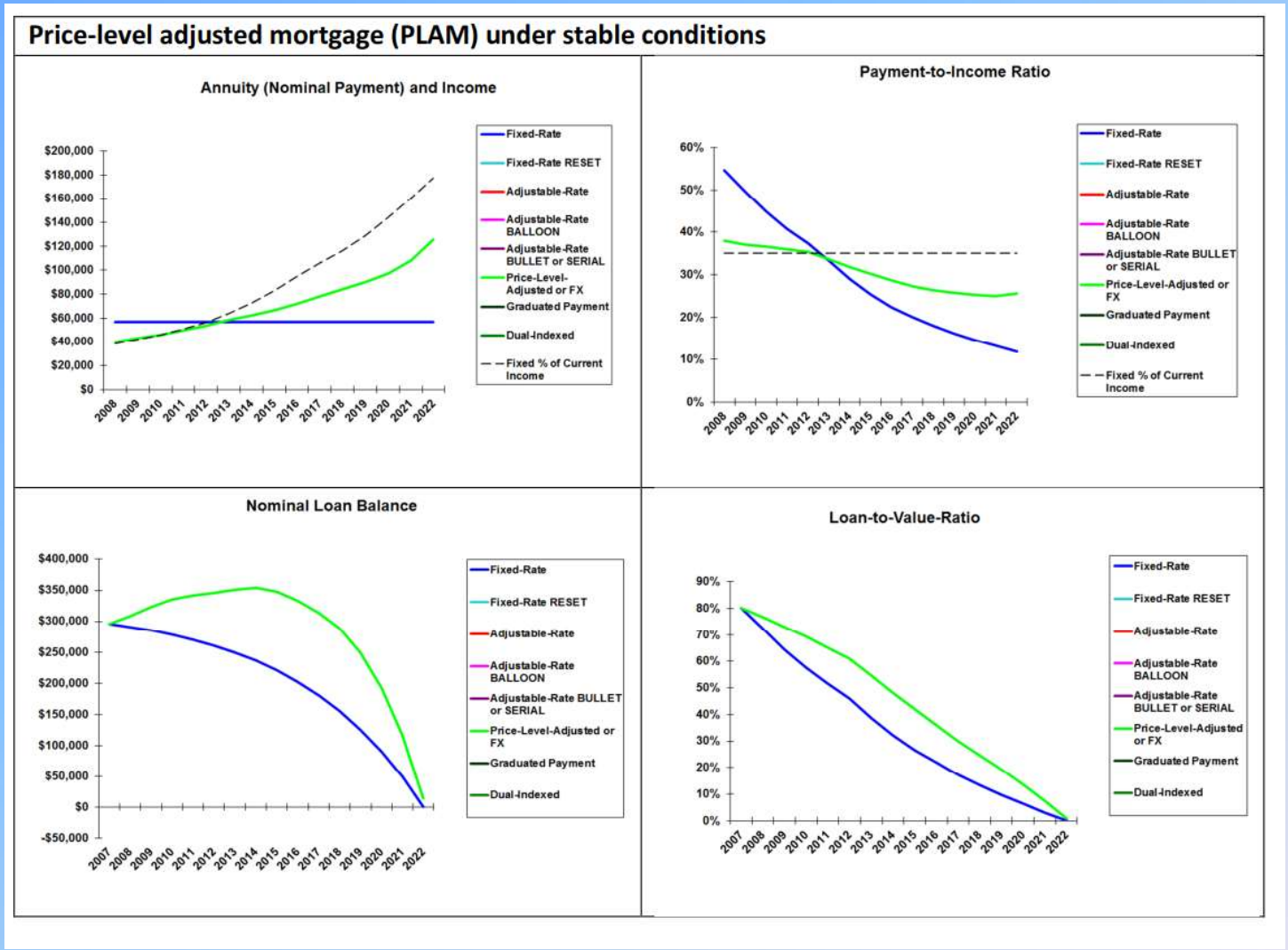
Capitalize inflation component of the nominal interest rate into principal



For a **12%, 15 year loan** the initial payment under the PLAM in the example is **13.7%**

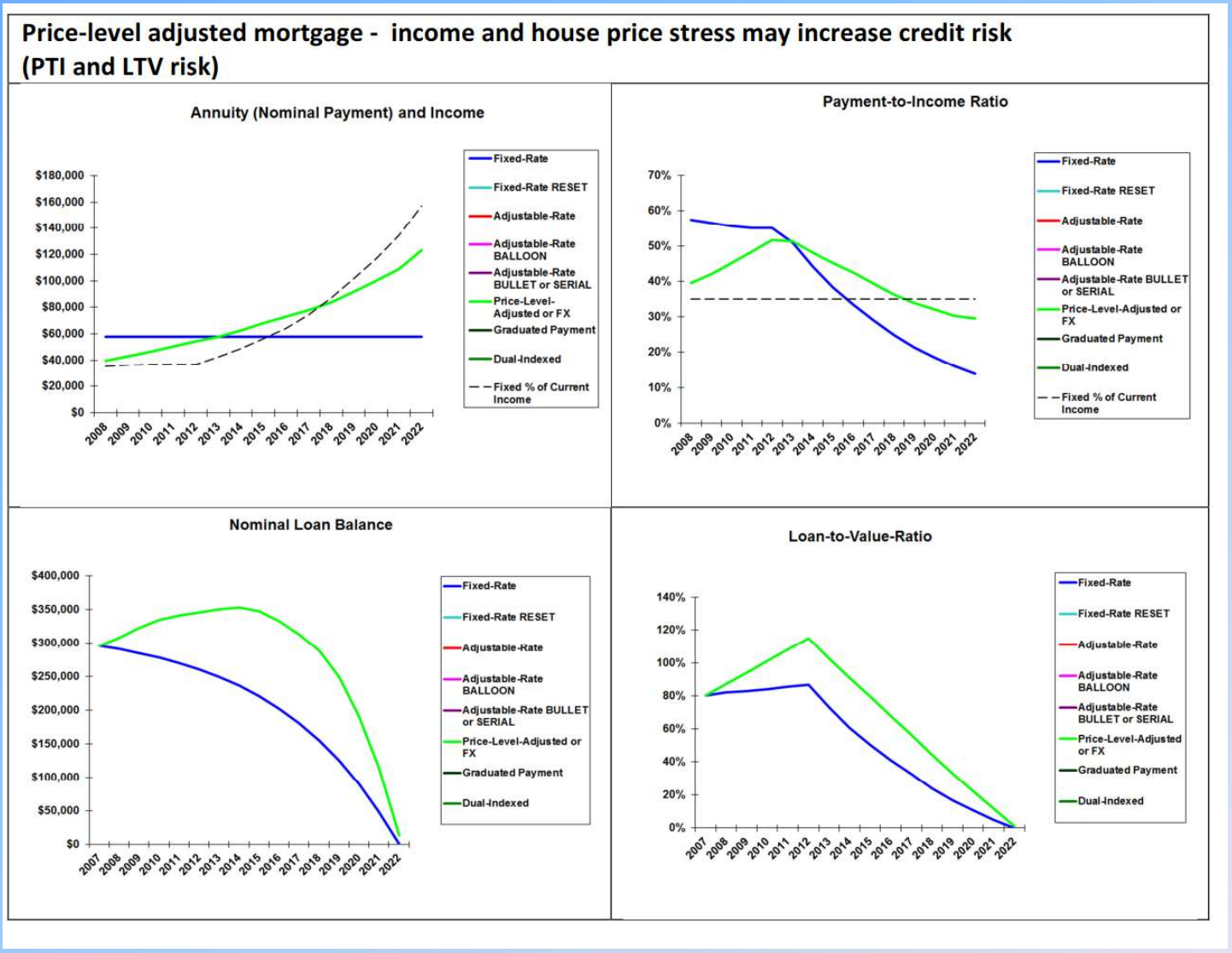
PLAM avoids the recast risks of the GPM (16.2%) while it is initially more affordable than the annuity mortgage (14.7%)

PLAM Under Stable Conditions



Stable conditions: inflation, house prices and wages grow with similar rates
Note: different numerical example

PLAM Under Unstable Conditions



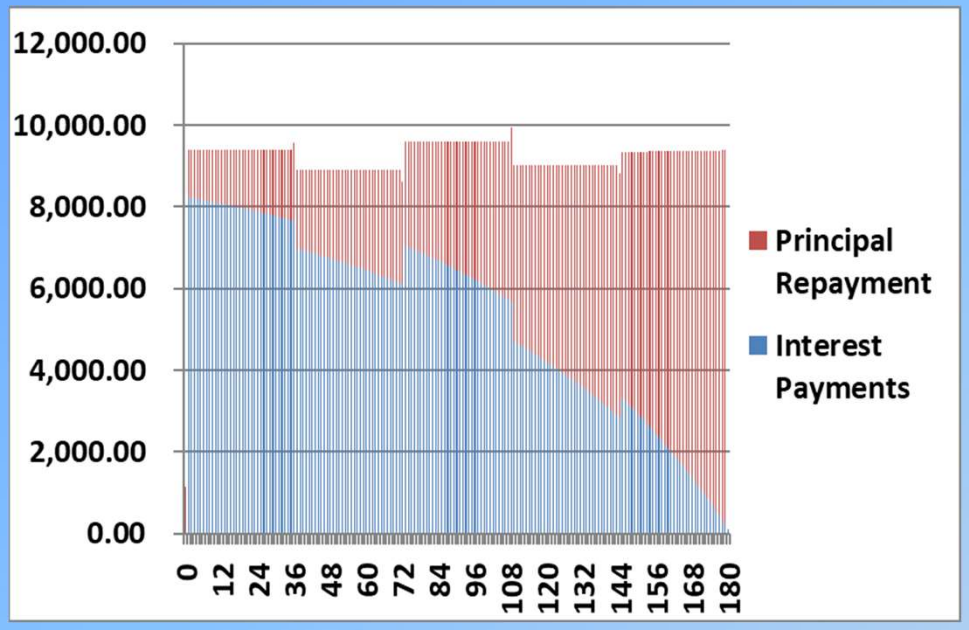
Unstable conditions: in the first 5 years of the example, house prices and wages grow lower than the inflation rate. Still usually not as extreme as in the case of FX lending.

Reset Fixed-Rate Mortgages (rFRM)

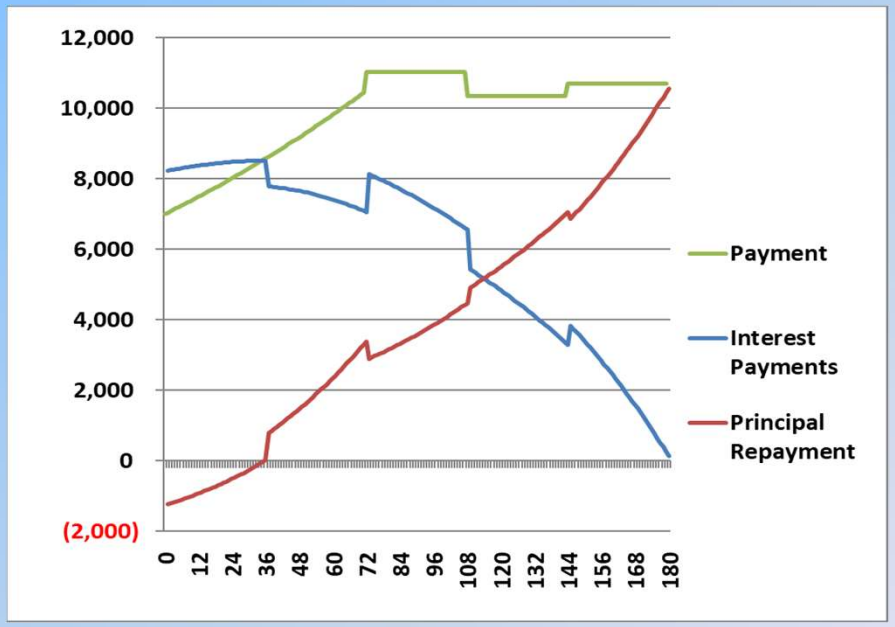
- Idea: take advantage of inflation decline, while providing sufficient protection against inflation increase
- Mechanics:
  - Define benchmark for 3 or 5 year fixed rates.
  - Allow banks to compete on spreads over this benchmark, fixed over the life of the loan.
  - Increasing amortization, as in fixed rate mortgage. Loan to be recast depending on interest rate level after reset date.
- Advantages:
  - Borrowers pay lower and more affordable rates, lender is less mismatched.
- Disadvantages
  - BIG problem: Tilt effect is not addressed, so works best in combination with GPM / initial teaser rates.

Reset FRM Payment Profiles

Standard, 3 yr Rate Reset



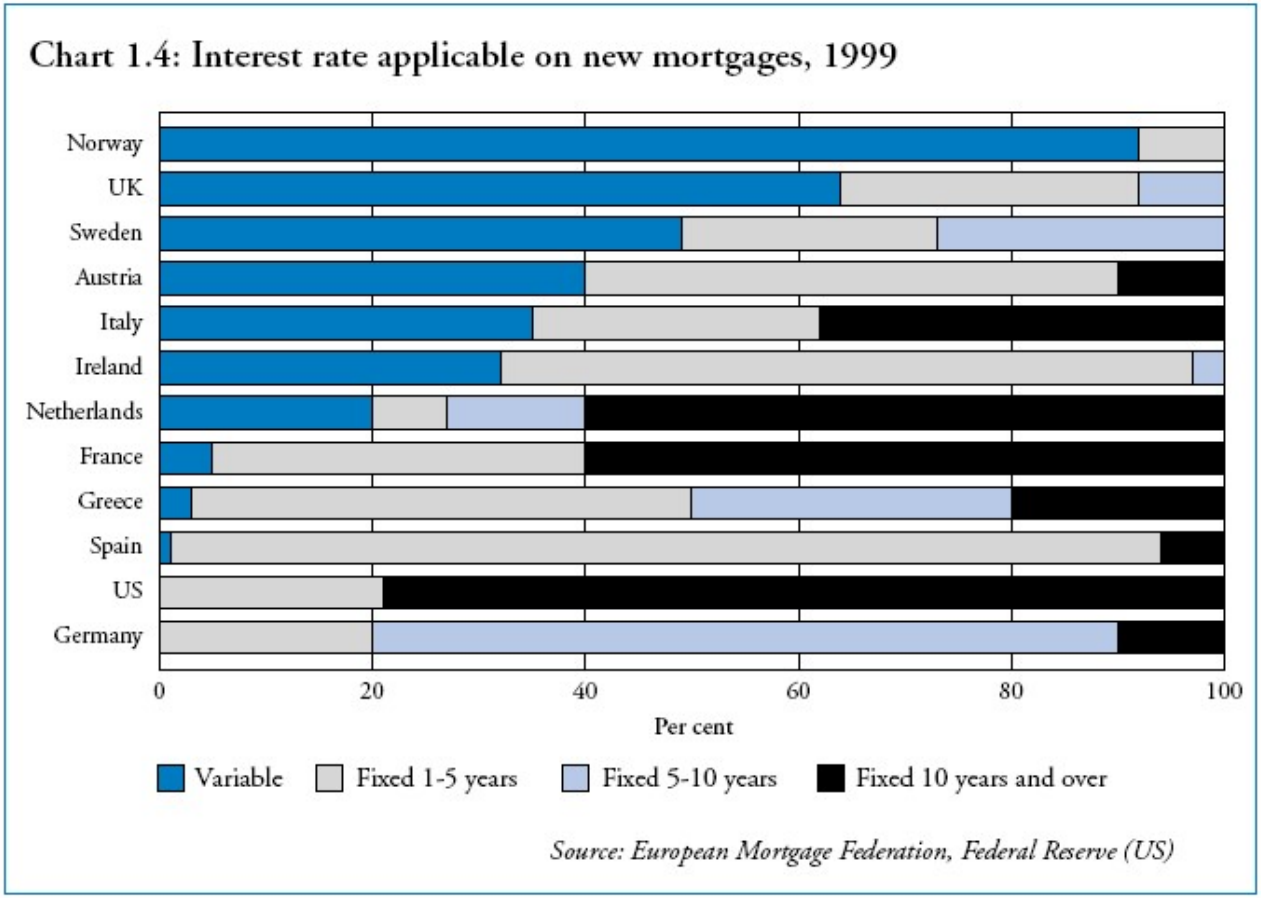
Combined with GPM



Rate shocks can be cushioned through caps, cheaper than fixed rate since risk is shared between lenders and borrowers.

Combination with GPM may lead to payment spike, hence as a precaution choose higher graduation rates.

Most Housing Finance Systems use Variable or Reset FRMs



Source: David Miles. Report download from www.treasury.gov.uk