The Value of Mortgage Choice:
Payment Structure and Contract Length

Michael Boutros[1] Nuno Clara[2] Katya Kartashova[3]

ABFER 2026
May 20, 2026

[1]University of Toronto [2]Fuqua School of Business (Duke University) [3]Bank of Canada
*The views expressed herein are those of the authors and do not necessarily reflect those of the Bank of Canada.

Introduction

- Mortgages are the largest component of households balance sheets.

Introduction

- Mortgages are the largest component of households balance sheets.
- Details of mortgage contracts are important for:
  - Households: welfare via consumption, labor, mobility.
  - Macroeconomy: aggregate productivity, monetary policy transmission.

Introduction

- Mortgages are the largest component of households balance sheets.
- Details of mortgage contracts are important for:
    - Households: welfare via consumption, labor, mobility.
    - Macroeconomy: aggregate productivity, monetary policy transmission.
- Two mortgage types prevalent in most economies around the world:
    1. Fixed-Rate Fixed-Payment (FF): interest rate risk borne by lenders.

Introduction

- Mortgages are the largest component of households balance sheets.
- Details of mortgage contracts are important for:
  - Households: welfare via consumption, labor, mobility.
  - Macroeconomy: aggregate productivity, monetary policy transmission.

- Two mortgage types prevalent in most economies around the world:
  1. Fixed-Rate Fixed-Payment (FF): interest rate risk borne by lenders.
  2. Variable-Rate Variable-Payment (VV): interest rate risk borne by borrowers.

Introduction

- Mortgages are the largest component of households balance sheets.
- Details of mortgage contracts are important for:
  - Households: welfare via consumption, labor, mobility.
  - Macroeconomy: aggregate productivity, monetary policy transmission.
- Two mortgage types prevalent in most economies around the world:
  1. Fixed-Rate Fixed-Payment (FF): interest rate risk borne by lenders.
  2. Variable-Rate Variable-Payment (VV): interest rate risk borne by borrowers.
- This paper introduces third hybrid mortgage type to academic literature:
  3. **Variable-Rate Fixed-Payment (VF)**: interest rate risk sharing.

Research Questions

How do households value different types of mortgage contracts??

Research Questions

How do households value different types of mortgage contracts??

1. For which households and economic conditions is each contract optimal?

2. How do payment structure and contract length interact?

Research Questions

How do households value different types of mortgage contracts??

1. For which households and economic conditions is each contract optimal?
    - Analyze mortgages from a risk-management perspective.
    - Different mortgage types offer different forms of insurance.
    - Lenders price insurance benefits ex-ante
2. How do payment structure and contract length interact?

Research Questions

How do households value different types of mortgage contracts??

1. For which households and economic conditions is each contract optimal?
    - Analyze mortgages from a risk-management perspective.
    - Different mortgage types offer different forms of insurance.
    - Lenders price insurance benefits ex-ante
2. How do payment structure and contract length interact?
    - Contract length (term) typically less than total amortization period.
    - In most countries, multiple terms (contracts) over life of mortgage.
    - U.S. is global outlier with single long-term contract.

Methodology

To answer these questions, we build a **life-cycle model** of mortgage choice:

Methodology

To answer these questions, we build a **life-cycle model** of mortgage choice:

- Optimal consumption/saving with stochastic income, short-term interest rates, and term premia.
- Homeowners choose optimal mortgage contracts (FF, VF, VV) with refinancing over life of loan.
- Rich modeling of mortgage contract structure to capture different institutional settings.

Methodology

To answer these questions, we build a **life-cycle model** of mortgage choice:

- Optimal consumption/saving with stochastic income, short-term interest rates, and term premia.
- Homeowners choose optimal mortgage contracts (FF, VF, VV) with refinancing over life of loan.
- Rich modeling of mortgage contract structure to capture different institutional settings.

Optimal **mortgage choice** depends on:

- Aggregate state variables: level of interest rates, term premia
- Individual agent's state variables: leverage, liquid wealth and income

Main Results

1. Value from menu of mortgage types in offering different **risk management**.

Main Results

1. Value from menu of mortgage types in offering different **risk management**.
    - Mortgage contracts insure against **payment risk** and/or **balance risk**.
    - Large welfare losses between 1% and 3% when one mortgage offered.

Main Results

1. Value from menu of mortgage types in offering different **risk management**.
   - Mortgage contracts insure against **payment risk** and/or **balance risk**.
   - Large welfare losses between 1% and 3% when one mortgage offered.
2. U.S. mortgage structure with single long-term FF contract **reduces welfare** relative to full menu with shorter contracts.
   - Limited contract choice leads to welfare losses.
   - Refinancing option (on long-term contract) is priced ex-ante.

Main Results

1. Value from menu of mortgage types in offering different **risk management**.
    - Mortgage contracts insure against **payment risk** and/or **balance risk**.
    - Large welfare losses between 1% and 3% when one mortgage offered.
2. U.S. mortgage structure with single long-term FF contract **reduces welfare** relative to full menu with shorter contracts.
    - Limited contract choice leads to welfare losses.
    - Refinancing option (on long-term contract) is priced ex-ante.
3. Monetary policy passthrough depends on **distribution of mortgages**.

Model

Model: Overview

- Lifecycle **households** make consumption choice, saving choice, and mortgage choice **in every period.**

Model: Overview

- Lifecycle **households** make consumption choice, saving choice, and mortgage choice **in every period.**
- **Bond market** of one- and multi-year bonds used for saving and pricing mortgages.

$$R_1 \equiv \text{ N-Year Bond (AR1)}, \quad R_N \equiv \text{N-Year Bond = EH}(R_1) \text{ + Term Premium (AR1)}$$

Model: Overview

- Lifecycle **households** make consumption choice, saving choice, and mortgage choice **in every period.**
- **Bond market** of one- and multi-year bonds used for saving and pricing mortgages.

$$R_1 \equiv \text{ N-Year Bond (AR1)}, \quad R_N \equiv \text{N-Year Bond = EH}(R_1) \text{ + Term Premium (AR1)}$$

- **Financial Institution** supplies mortgage $\chi \in \{\text{FF}, \text{VF}, \text{VV}\}$ with interest rate:

$$R_{\chi,t} \equiv R_\chi(\{r_{n,t}\}_n, \phi_\chi),$$

where $\{r_{n,t}\}_n$ is bond yield curve and ϕ_χ is mortgage premium.

Model: Mortgage Types

Households select from menu of three mortgage types:

1. FF ($\approx$ FRM): payments fixed to contract interest rate.
2. VV ($\approx$ ARM): payments immediately change with market rate changes.

	Mortgage Type	Interest Payment (R_I)	Total Payment (R_T)
FF	Fixed-Fixed	Contract Rate	Contract Rate
VV	Variable-Variable	Market Rate	Market Rate

Model: Mortgage Types

Households select from menu of three mortgage types:

3. Variable-Fixed (VF):

   - Two interest rates used for pricing payments:

Model: Mortgage Types

Households select from menu of three mortgage types:

3. Variable-Fixed (VF):

- Two interest rates used for pricing payments:
  1. (1) payment factor: contract rate used to set total payment.
  2. (2) interest factor: market rate used to calculate interest payments.
- At origination, payment $=$ interest factor.

Model: Mortgage Types

Households select from menu of three mortgage types:

3. Variable-Fixed (VF):

- Two interest rates used for pricing payments:
  (1) payment factor: contract rate used to set total payment.
  (2) interest factor: market rate used to calculate interest payments.
- At origination, payment $=$ interest factor.
- When payment $\neq$ interest factor:
  - **Within** term: principal absorbs the difference.

Model: Mortgage Types

Households select from menu of three mortgage types:

3. Variable-Fixed (VF):

- Two interest rates used for pricing payments:
  (1) payment factor: contract rate used to set total payment.
  (2) interest factor: market rate used to calculate interest payments.
- At origination, payment $=$ interest factor.
- When payment $\neq$ interest factor:
  - **Within** term: principal absorbs the difference.
  - **Across** terms: payments reset to keep contractual amortization. Without reset, variable amortization period (as in Black (1998)).

Model: Mortgage Types

Summary of Mortgage Types and Interest Rates

	Mortgage Type	Interest Payment (R_I)	Total Payment (R_T)
FF	Fixed-Fixed	Contract Rate	Contract Rate
VF	Variable-Fixed	Market Rate	Contract Rate
VV	Variable-Variable	Market Rate	Market Rate

Model: Mortgage Types

Summary of Mortgage Types and Interest Rates

	Mortgage Type	Interest Payment (R_I)	Total Payment (R_T)
FF	Fixed-Fixed	Contract Rate	Contract Rate
VF	Variable-Fixed	Market Rate	Contract Rate
VV	Variable-Variable	Market Rate	Market Rate

Conditional on calibration of mortgage adjustment costs:

- Households choose between **continuing in the same mortgage contract** or **refinancing into new contract**.

Model: Mortgage Types

Summary of Mortgage Types and Interest Rates

	Mortgage Type	Interest Payment (R_I)	Total Payment (R_T)
FF	Fixed-Fixed	Contract Rate	Contract Rate
VF	Variable-Fixed	Market Rate	Contract Rate
VV	Variable-Variable	Market Rate	Market Rate

Conditional on calibration of mortgage adjustment costs:

- Households choose between **continuing in the same mortgage contract** or **refinancing into new contract**.
- When refinancing, menu of contracts available:
    - Refinance into **different mortgage type** with market rates.
    - Refinance into **same mortgage type** with market (i.e. **different**) rates.

Model: Homeowner with Mortgages

$$V^{Owner,Mortgage}(S_i, A) = \max\left\{V^{Continue}(S_i, A), V^{Refinance}(S_i, A), V^{Owner,Rent}(S_i, A)\right\}$$

$S_i \equiv \{Age_{it}, W_{it}, Z_{it}, M_{it}, \chi_{i,t-1}, R^M_{i,t-1}\}$, and $A \equiv \{R_{1,t}, \omega_t\}$.

Model: Homeowner with Mortgages

$$V^{Owner,Mortgage}(S_i, A) = \max\left\{V^{Continue}(S_i, A), V^{Refinance}(S_i, A), V^{Owner,Rent}(S_i, A)\right\}$$

$S_i \equiv \{Age_{it}, W_{it}, Z_{it}, M_{it}, \chi_{i,t-1}, R^M_{i,t-1}\}$, and $A \equiv \{R_{1,t}, \omega_t\}$.

Option: Continue in the Same Contract

$$V^{Continue}(S_i, A) = \begin{cases} V^M(\{R_i^M, R_i^M\}, S_i, A) - \gamma_t(FF) & \text{if } \chi_i = FF, \\ V^M(\{R_i^M, R_{VF}\}, S_i, A) - \gamma_t(VF) & \text{if } \chi_i = VF, \\ V^M(\{R_{VV}, R_{VV}\}, S_i, A) - \gamma_t(VV) & \text{if } \chi_i = VV. \end{cases}$$

Model: Homeowner with Mortgages

$$V^{Owner,Mortgage}(S_i, A) = \max\left\{V^{Continue}(S_i, A), V^{Refinance}(S_i, A), V^{Owner,Rent}(S_i, A)\right\}$$

$S_i \equiv \{Age_{it}, W_{it}, Z_{it}, M_{it}, \chi_{i,t-1}, R^M_{i,t-1}\}$, and $A \equiv \{R_{1,t}, \omega_t\}$.

Option: Continue in the Same Contract

$$V^{Continue}(S_i, A) = \begin{cases} V^M(\{R^M_i, R^M_i\}, S_i, A) - \gamma_t(FF) & \text{if } \chi_i = FF, \\ V^M(\{R^M_i, R_{VF}\}, S_i, A) - \gamma_t(VF) & \text{if } \chi_i = VF, \\ V^M(\{R_{VV}, R_{VV}\}, S_i, A) - \gamma_t(VV) & \text{if } \chi_i = VV. \end{cases}$$

Option: Refinance into a New Contract

$$\begin{aligned} V^{Refinance}(S_i, A) = \max\{&V^M(\{R_{FF}, R_{FF}\}, S_i, A) - \kappa_t(FF|\chi_i) + \sigma\epsilon_{FF,i}, \\ &V^M(\{R_{VF}, R_{VF}\}, S_i, A) - \kappa_t(VF|\chi_i) + \sigma\epsilon_{VF,i}, \\ &V^M(\{R_{VV}, R_{VV}\}, S_i, A) - \kappa_t(VV|\chi_i) + \sigma\epsilon_{VV,i}\}. \end{aligned}$$

Calibration and Drivers of Mortgage Choice

Calibration: Canadian Mortgage Market

1. Mortgages have **5-year terms** and **25-year amortization**.

Calibration: Canadian Mortgage Market

1. Mortgages have **5-year terms** and **25-year amortization**.
2. Scheduled **renewals** at term and **no early refinancing** because of prepayment penalties.

$$\gamma_t(\chi) = \begin{cases} 0 & \text{if } t \in \tau_R \equiv \{6, 11, 16, 21\} \\ \infty & \text{if } t \in \tau_N \equiv \{1, 2, \ldots, 25\} \setminus \tau_R \end{cases}, \quad \kappa_t(\chi|\chi_-) = \begin{cases} \infty & \text{if } t \in \tau_R \\ 0 & \text{if } t \in \tau_N \end{cases}.$$

Calibration: Canadian Mortgage Market

1. Mortgages have **5-year terms** and **25-year amortization**.
2. Scheduled **renewals** at term and **no early refinancing** because of prepayment penalties.

$$\gamma_t(\chi) = \begin{cases} 0 & \text{if } t \in \tau_R \equiv \{6, 11, 16, 21\} \\ \infty & \text{if } t \in \tau_N \equiv \{1, 2, \dots, 25\} \setminus \tau_R \end{cases}, \quad \kappa_t(\chi|\chi_-) = \begin{cases} \infty & \text{if } t \in \tau_R \\ 0 & \text{if } t \in \tau_N \end{cases}.$$

3. Mortgage rates priced from yield curve and type-specific mortgage premium:

$$R_{VV,t} = R_{1,t} + \phi_{VV}, \quad R_{VF,t} = R_{1,t} + \phi_{VF}, \quad R_{FF,t} = R_{5,t} + \phi_{FF}.$$

Calibration: Canadian Mortgage Market

1. Income process: Canadian Survey of Financial Security for mortgage holders. Guvenen et al. (2021) stochastic process Income process
2. Interest rate process: Canadian 1-year government bond yields (GOC-1) 1985-2023 interest rate data
3. Term-premia: GOC-5, 1980-2021 combined with the above agg. processes calibration
4. Mortgage premia: average premia for new originations by type of mortgage mortgage premia
5. Initial distribution of house sizes, loan-to-income, financial savings to match empirical counterparts
6. Preference parameters and EVT shocks: grid search to minimize distance between mortgage originations by type in the data and in the model model fit

Drivers of Mortgage Choice

1. **Aggregate Factors**: Interest rate and term premium
   - Shape of yield curve has important implications for mortgage spreads and mortgage choice.
   - FF vs. V* (VV/VF) depends on term premium: FF when TP is low.
   - Consistent with large body of empirical evidence.

Drivers of Mortgage Choice

1. **Aggregate Factors**: Interest rate and term premium
    - Shape of yield curve has important implications for mortgage spreads and mortgage choice.
    - FF vs. V* (VV/VF) depends on term premium: FF when TP is low.
    - Consistent with large body of empirical evidence.
2. **Idiosyncratic Factors**: Cash-on-hand, leverage, and preferences.
    - Conditional on yield curve, households choose mortgages to trade off different forms of risk.

Mortgage Choice and Risk Management

- Mortgage contracts in our model feature two **types of risk**:

    1. **Payment Risk** (Liquidity): variation in mortgage payments.
    2. **Balance Risk** (Wealth): variation in mortgage balance at renewal.

Mortgage Choice and Risk Management

- Mortgage contracts in our model feature two **types of risk**:

  1. **Payment Risk** (Liquidity): variation in mortgage payments.
  2. **Balance Risk** (Wealth): variation in mortgage balance at renewal.

- **Value** of heterogeneous contracts in allowing for households to **insure** against different risks.

	Fixed-Fixed	Variable-Fixed	Variable-Variable
Payment Risk			
Balance Risk			

Mortgage Choice and Risk Management

- Mortgage contracts in our model feature two **types of risk**:

  1. **Payment Risk** (Liquidity): variation in mortgage payments.
  2. **Balance Risk** (Wealth): variation in mortgage balance at renewal.

- **Value** of heterogeneous contracts in allowing for households to **insure** against different risks.

	Fixed-Fixed	Variable-Fixed	Variable-Variable
Payment Risk	✗		
Balance Risk	✗		

Mortgage Choice and Risk Management

- Mortgage contracts in our model feature two **types of risk**:
    1. **Payment Risk** (Liquidity): variation in mortgage payments.
    2. **Balance Risk** (Wealth): variation in mortgage balance at renewal.
- **Value** of heterogeneous contracts in allowing for households to **insure** against different risks.

	Fixed-Fixed	Variable-Fixed	Variable-Variable
Payment Risk	✗		✓
Balance Risk	✗		✗

Mortgage Choice and Risk Management

- Mortgage contracts in our model feature two **types of risk**:

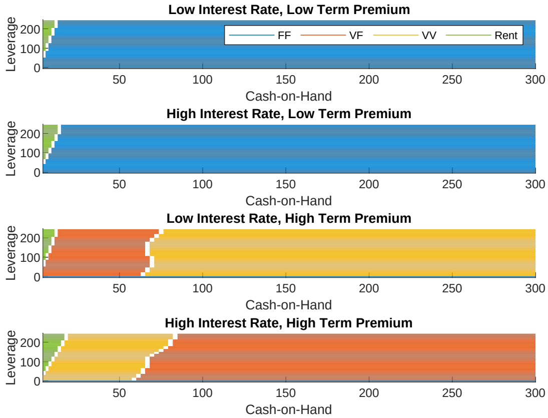
  1. **Payment Risk** (Liquidity): variation in mortgage payments.
  2. **Balance Risk** (Wealth): variation in mortgage balance at renewal.

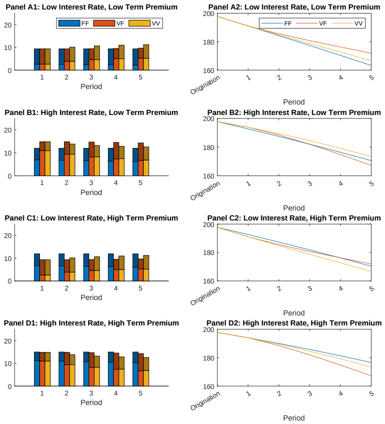
- **Value** of heterogeneous contracts in allowing for households to **insure** against different risks.

	Fixed-Fixed	Variable-Fixed	Variable-Variable
Payment Risk	✗	✗	✓
Balance Risk	✗	✓	✗

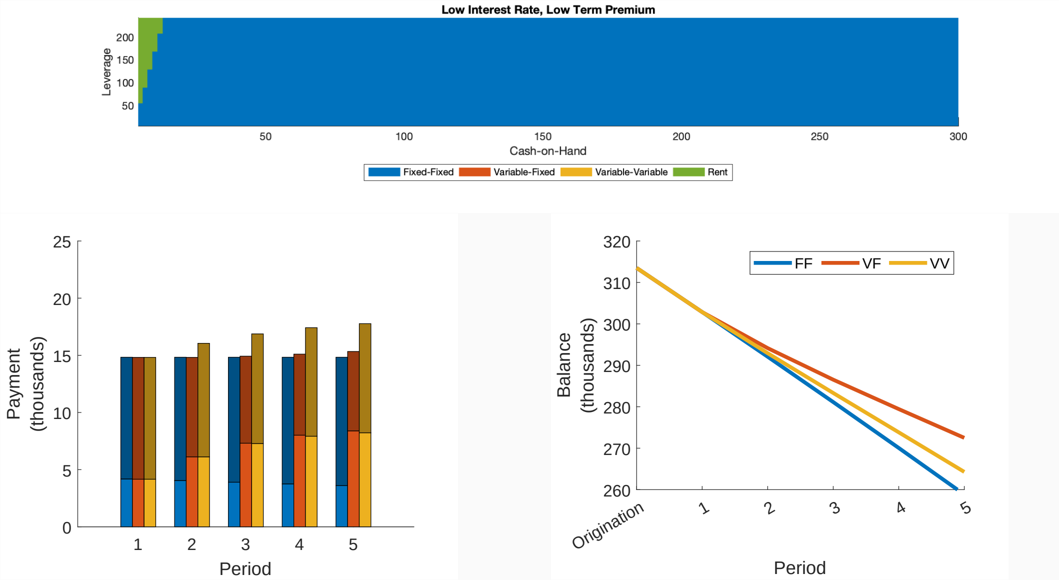
Drivers of mortgage type choice

- Model provides **mortgage choice policy function** to help us understand behavior at the household level.

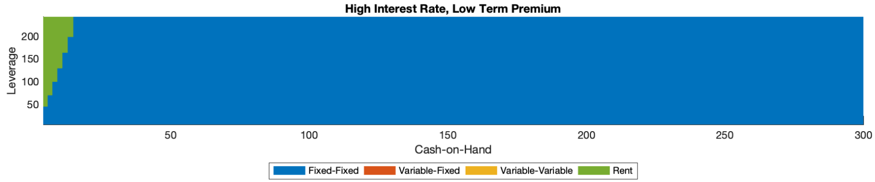


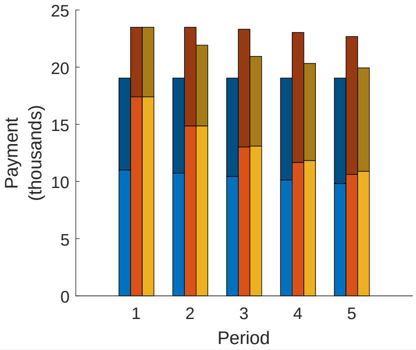


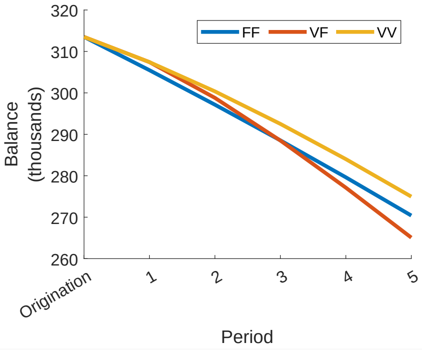
Mortgage Choice: Low term premium, low interest rates



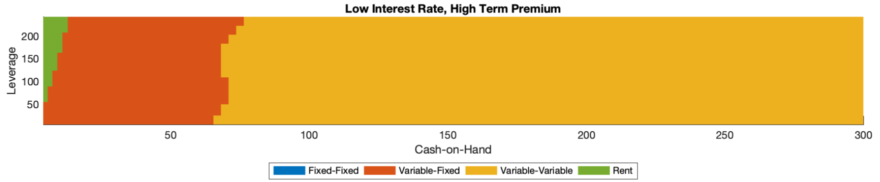
Mortgage Choice: Low term premium, high interest rates

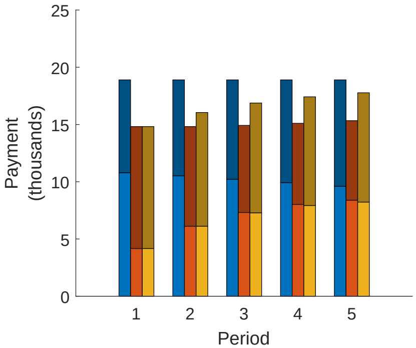


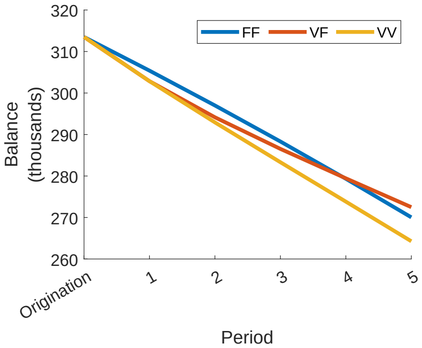




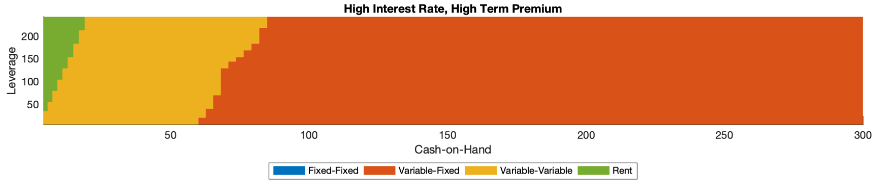
Mortgage Choice: High term premium, low interest rates

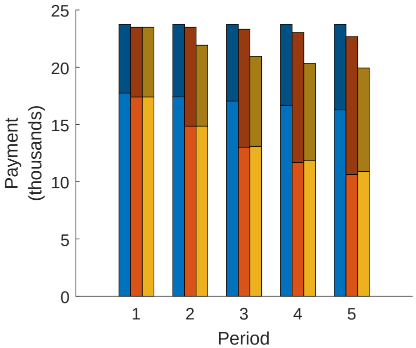


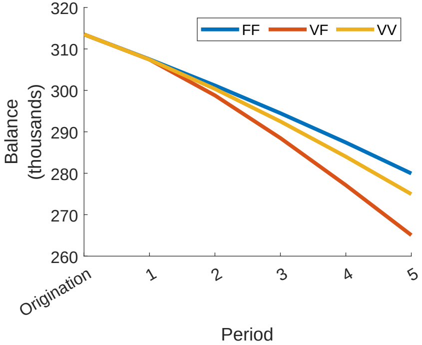




Mortgage Choice: High term premium, high interest rates







Main Results

1. Quantifying the Value of Mortgage Choice

- Counterfactual economies with only one type of contract.
- Simulate OLG economies, calculate differences in lifetime CE.
- Lender reprices mortgage premia ϕ_χ for profit equivalence.

1. Quantifying the Value of Mortgage Choice

- Counterfactual economies with only one type of contract.
- Simulate OLG economies, calculate differences in lifetime CE.
- Lender reprices mortgage premia ϕ_χ for profit equivalence.

	FF only	VF only	VV only
Unconditional	-3.18%	-1.82%	-2.79%

1. Quantifying the Value of Mortgage Choice

- Counterfactual economies with only one type of contract.
- Simulate OLG economies, calculate differences in lifetime CE.
- Lender reprices mortgage premia ϕ_χ for profit equivalence.

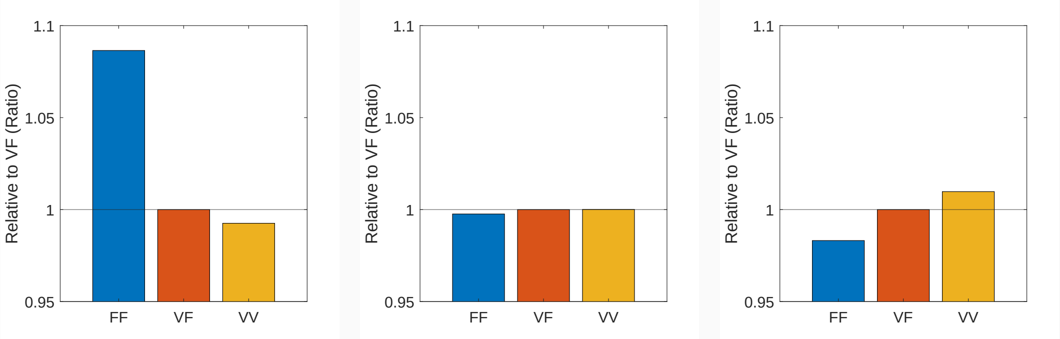
	FF only	VF only	VV only
Unconditional	-3.18%	-1.82%	-2.79%
High R, High TP	-6.11%	-0.26%	-1.51%
High R, Low TP	-1.93%	-3.74%	-4.95%

1. Quantifying the Value of Mortgage Choice

- Counterfactual economies with only one type of contract.
- Simulate OLG economies, calculate differences in lifetime CE.
- Lender reprices mortgage premia ϕ_χ for profit equivalence.

	FF only	VF only	VV only
Unconditional	-3.18%	-1.82%	-2.79%
High R, High TP	-6.11%	-0.26%	-1.51%
High R, Low TP	-1.93%	-3.74%	-4.95%
Low R, High TP	-3.43%	-0.50%	-1.23%
Low R, Low TP	-1.48%	-2.76%	-3.52%

1. Quantifying the Value of Mortgage Choice: Costs vs. Benefits of VF Mortgage



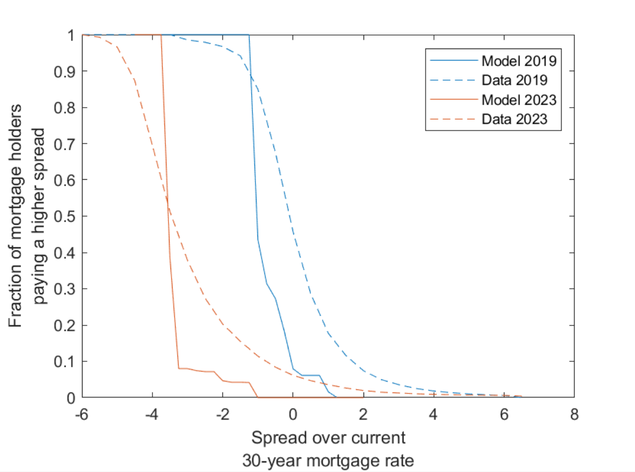
(a) Total interest cost

(b) Average Consumption (levels)

(c) Std. Consumption Growth

2. Analysis of Long-Term Contracts (U.S. System)

- Recalibrate refinancing costs to match U.S. (Chen et al., 2020).



2. Analysis of Long-Term Contracts (U.S. System)

- Counterfactual economies, calculate difference in lifetime CE, lender reprices for profit equivalence.
- Single-product economies, comparison to full menu of contracts in Canada.

Scenario		Δ Loan Premium	Welfare
1	FRM with Short-Term Contract	-0.07%	-3.18%

2. Analysis of Long-Term Contracts (U.S. System)

- Counterfactual economies, calculate difference in lifetime CE, lender reprices for profit equivalence.
- Single-product economies, comparison to full menu of contracts in Canada.

	Scenario	Δ Loan Premium	Welfare
1	FRM with Short-Term Contract	-0.07%	-3.18%
2	FRM with Long-Term Contract	0.00%	7.04%

2. Analysis of Long-Term Contracts (U.S. System)

- Counterfactual economies, calculate difference in lifetime CE, lender reprices for profit equivalence.
- Single-product economies, comparison to full menu of contracts in Canada.

Scenario		Δ Loan Premium	Welfare
1	FRM with Short-Term Contract	-0.07%	-3.18%
2	FRM with Long-Term Contract	0.00%	7.04%
3	FRM with Long-Term Contract	1.48%	-4.08%

- Large decrease in welfare due to large increase in loan premium.
- Lenders to price refinancing risk into rates ex-ante.

3. Monetary Policy Passthrough

- Simulate monetary policy shocks and study the change in consumption under four versions of the model: baseline and each one-type model.
- Measure impact using Jorda (2005) local projections:

$$s_t^r \equiv MP_t^{surprise} = r_t - E_{t-1}[r_t] \tag{1}$$

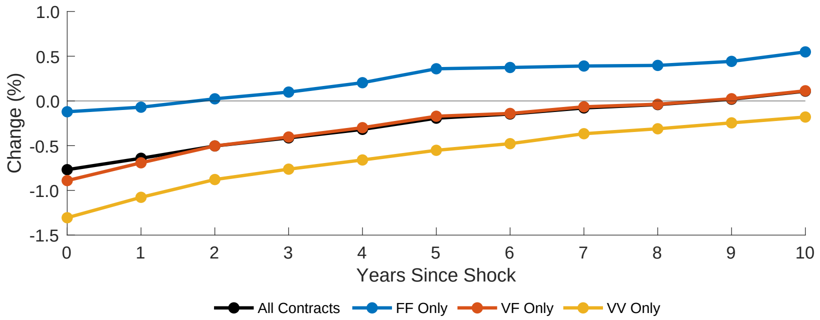
$$s_t^{tp} \equiv TP_t^{surprise} = \omega_t - E_{t-1}[\omega_t] \tag{2}$$

- Estimate impulse response function:

$$y_{t+h} = \alpha_h + \beta_h s_t + v_{t+h}; \qquad h = 0, 1, 2, ...H \tag{3}$$

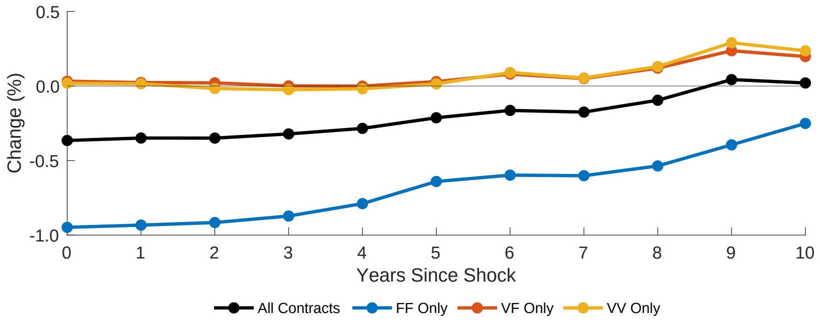
3. Monetary Policy Passthrough

Figure: Consumption Response to Conventional MP Shock (1-Year Bond)



3. Monetary Policy Passthrough

Figure: Consumption Response to Unconventional MP Shock (Term Premium)



Conclusion

- Introduce Variable-Fixed mortgage to the academic literature and revisit key questions in mortgage choice.
- We build a general model of mortgage choice that can replicate key institutional features in Canada, the US, and elsewhere.
- Model allows us to think about drivers of mortgage choice at both the aggregate level and household level.
- We use the model to study welfare benefits of multiple contracts, different institutional settings, and the impact of monetary policy.

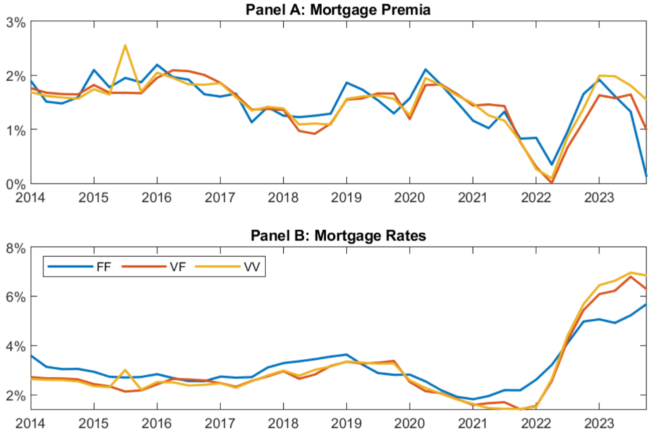
The Value of Mortgage Choice: Payment Structure and Contract Length

Michael Boutros[1] Nuno Clara[2] Katya Kartashova[3]

ABFER 2026
May 20, 2026

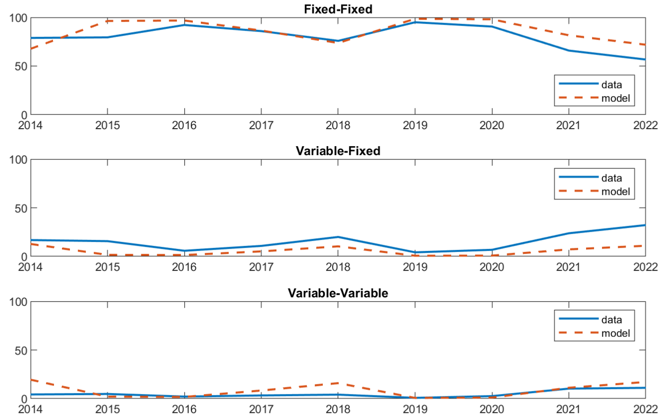
[1]University of Toronto [2]Fuqua School of Business (Duke University) [3]Bank of Canada
*The views expressed herein are those of the authors and do not necessarily reflect those of the Bank of Canada.

Mortgage premia



back

Model fit



- $\sigma = 0.01$, $\beta = 0.95$, $\gamma = 10$, $\psi = 0.75$

back

Aggregate Processes: Interest rate and term-premia

(a) One-Period Bond

Parameter	Value
$\bar{r}$	0.0298
ρ_r	0.8965
σ_r	0.0121

(b) Term Premium

Parameter	Value
$\bar{\omega}$	0.0042
ρ_ω	0.741
σ_ω	0.0052

(c) Mortgage Terms and Premia

Parameter	Value
N_M	5
ϕ_{FF}	0.015
ϕ_{VF}	0.015
ϕ_{VV}	0.015

back

Income process

$$
\begin{aligned}
Y_t^i &= (1-\nu_t^i)\exp(g(t)+\alpha^i+z_t^i+\epsilon_t^i) \\
z_t^i &= \rho z_{t-1}^i + \eta_t^i \\
\eta_t^i &\sim \begin{cases} \mathcal{N}(\mu_{\eta,1},\sigma_{\eta,1}) & \text{with prob. } p_z, \\ \mathcal{N}(\mu_{\eta,2},\sigma_{\eta,2}) & \text{with prob. } 1-p_z \end{cases} \\
\epsilon_t^i &\sim \begin{cases} \mathcal{N}(\mu_{\epsilon,1},\sigma_{\epsilon,1}) & \text{with prob. } p_\epsilon, \\ \mathcal{N}(\mu_{\epsilon,2},\sigma_{\epsilon,2}) & \text{with prob. } 1-p_\epsilon \end{cases} \\
1-\nu_t^i &= \begin{cases} 1 & \text{with prob. } 1-p_\nu(t,z_t^i), \\ \lambda & \text{with prob. } p_\nu(t,z_t^i) \end{cases} \\
p_\nu^i(t,z_t) &= \frac{\exp(a_\nu+b_\nu t+c_\nu z_t^i+d_\nu z_t^i t)}{1+\exp(a_\nu+b_\nu t+c_\nu z_t^i+d_\nu z_t^i t)}.
\end{aligned}
$$

Income process calibration

Table 1: Income Process Parameters

(a) Deterministic Type & Life-cycle Components

Parameter	Value
α_i	0.99
a_0	-2.0317
a_1	0.3194
a_2	$-0.0577/10$
a_3	$-0.0033/100$
ω	0.94

(b) Unemployment Shock

Parameter	Value
λ	0.52
a_ν	-2.495
b_ν	-1.037
c_ν	-5.051
d_ν	-1.087

(c) Persistent Process

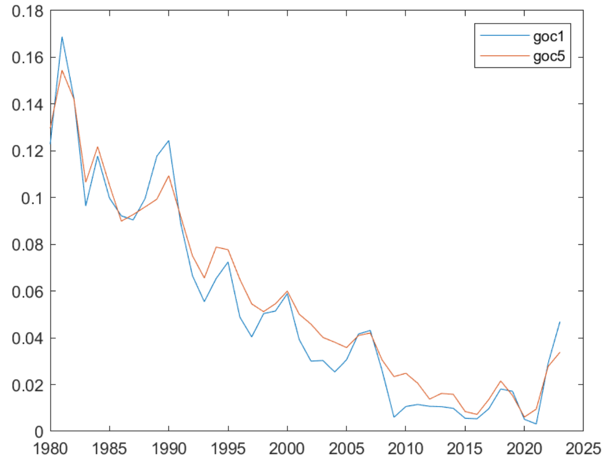
Parameter	Value
ρ	0.991
p_z	0.176
$\mu_{\eta,1}$	-0.524
$\sigma_{\eta,1}$	0.113
$\sigma_{\eta,2}$	0.046
κ_η	0.470

(d) Transitory Shock

Parameter	Value
p_ϵ	0.044
$\mu_{\epsilon,1}$	0.134
$\sigma_{\epsilon,1}$	0.762
$\sigma_{\epsilon,2}$	0.055

Back

GOC-1, GOC-5



Back

House prices

Two possibilities:

- $\Delta p_{it}^{H} = \mu_H + \zeta_{it}$, depends on wether we can scale the model. Likely yes.
- Only 2 point state variable required:

$$P_{ti} = \begin{cases} P_{0i}(1+\mu_H)^{t-1} & \text{for } S_t = 0 \\ P_{0i}(1+\mu_H)^{t-1}(1-\delta) & \text{for } S_t = 1 \end{cases}$$

Back

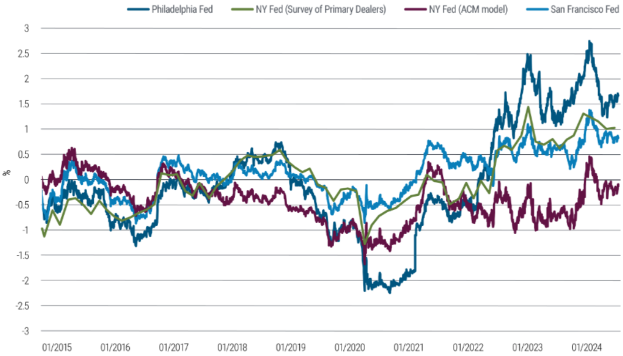
Supply side

$$\text{Expected present value}_{t'} = -D_{t'} + E_{t'} \sum_{j=t'+1}^{t'+M} \frac{CF_j}{\prod_{k=t'+1}^{j}(1 + R_{1,k-1})},$$

Back

Term-premium

Figure 1: Four term premium estimates



Source: Regional Federal Reserve banks, Bloomberg, and PIMCO calculations as of 12 April 2024.

Drivers of mortgage type choice (I)

	High interest rates		Low interest rates	
	High TP	Low TP	High TP	Low TP
Income	130.098	130.230	130.238	130.198
Income growth	0.014	0.014	0.014	0.014
Av. consumption growth	0.051	0.051	0.040	0.038
Std. consumption growth	0.255	0.245	0.212	0.210
Savings	179.597	179.215	165.283	163.780
Mtg. type proportion:				
Fixed-fixed	0.136	0.408	0.150	0.422
Variable-fixed	0.467	0.317	0.390	0.264
Variable-variable	0.397	0.275	0.460	0.314

Drivers of mortgage type choice (I)

	High interest rates		Low interest rates	
	High TP	Low TP	High TP	Low TP
Income	130.098	130.230	130.238	130.198
Income growth	0.014	0.014	0.014	0.014
Av. consumption growth	0.051	0.051	0.040	0.038
Std. consumption growth	0.255	0.245	0.212	0.210
Savings	179.597	179.215	165.283	163.780
Mtg. type proportion:				
Fixed-fixed	0.136	0.408	0.150	0.422
Variable-fixed	0.467	0.317	0.390	0.264
Variable-variable	0.397	0.275	0.460	0.314

Drivers of mortgage type choice (I)

	High interest rates		Low interest rates	
	High TP	Low TP	High TP	Low TP
Income	130.098	130.230	130.238	130.198
Income growth	0.014	0.014	0.014	0.014
Av. consumption growth	0.051	0.051	0.040	0.038
Std. consumption growth	0.255	0.245	0.212	0.210
Savings	179.597	179.215	165.283	163.780
Mtg. type proportion:				
Fixed-fixed	0.136	0.408	0.150	0.422
Variable-fixed	0.467	0.317	0.390	0.264
Variable-variable	0.397	0.275	0.460	0.314

Drivers of mortgage type choice (I)

	High interest rates		Low interest rates	
	High TP	Low TP	High TP	Low TP
Income	130.098	130.230	130.238	130.198
Income growth	0.014	0.014	0.014	0.014
Av. consumption growth	0.051	0.051	0.040	0.038
Std. consumption growth	0.255	0.245	0.212	0.210
Savings	179.597	179.215	165.283	163.780
Mtg. type proportion:				
Fixed-fixed	0.136	0.408	0.150	0.422
Variable-fixed	0.467	0.317	0.390	0.264
Variable-variable	0.397	0.275	0.460	0.314

Drivers of mortgage type choice (I)

	High interest rates		Low interest rates	
	High TP	Low TP	High TP	Low TP
Income	130.098	130.230	130.238	130.198
Income growth	0.014	0.014	0.014	0.014
Av. consumption growth	0.051	0.051	0.040	0.038
Std. consumption growth	0.255	0.245	0.212	0.210
Savings	179.597	179.215	165.283	163.780
Mtg. type proportion:				
Fixed-fixed	0.136	0.408	0.150	0.422
Variable-fixed	0.467	0.317	0.390	0.264
Variable-variable	0.397	0.275	0.460	0.314

Drivers of mortgage type choice (II)

	FF	VF	VV
Av. income	122.570	132.470	133.850
Av. savings	158.340	175.740	179.010
Av. leverage	150.390	134.620	135.100
Debt-to-income	1.750	1.465	1.425
Std. total mortg. pay	0.197	0.209	0.209
Std. total interest pay	0.023	0.028	0.028
Risk-free rate	0.029	0.033	0.028
Term-premia	0.000	0.006	0.006

Drivers of mortgage type choice (II)

	FF	VF	VV
Av. income	122.570	132.470	133.850
Av. savings	158.340	175.740	179.010
Av. leverage	150.390	134.620	135.100
Debt-to-income	1.750	1.465	1.425
Std. total mortg. pay	0.197	0.209	0.209
Std. total interest pay	0.023	0.028	0.028
Risk-free rate	0.029	0.033	0.028
Term-premia	0.000	0.006	0.006

Sensitivity to preference parameters

	Panel A			Panel B			Panel C		
	β = 0.93	β = 0.95	β = 0.97	γ = 5	$\gamma = 10$	γ = 15	ψ = 0.6	$\psi = 0.75$	ψ = 0.9
Av. cons growth	0.044	0.045	0.048	0.033	0.045	0.067	0.045	0.045	0.044
Std. cons growth	0.231	0.232	0.238	0.243	0.232	0.296	0.227	0.232	0.243
Savings	163.053	172.087	183.206	129.284	172.087	194.079	183.53	172.09	164.35
Mtg. type proportion:									
Fixed-fixed	0.295	0.278	0.255	0.288	0.278	0.268	0.292	0.278	0.282
Variable-fixed	0.359	0.36	0.365	0.344	0.36	0.387	0.359	0.36	0.347
Variable-variable	0.346	0.361	0.38	0.367	0.361	0.345	0.349	0.361	0.371

Sensitivity to preference parameters

	Panel A			Panel B			Panel C		
	$\beta = 0.93$	$\beta = 0.95$	$\beta = 0.97$	$\gamma = 5$	$\gamma = 10$	$\gamma = 15$	$\psi = 0.6$	$\psi = 0.75$	$\psi = 0.9$
Av. cons growth	0.044	0.045	0.048	0.033	0.045	0.067	0.045	0.045	0.044
Std. cons growth	0.231	0.232	0.238	0.243	0.232	0.296	0.227	0.232	0.243
Savings	163.053	172.087	183.206	129.284	172.087	194.079	183.53	172.09	164.35
Mtg. type proportion:									
Fixed-fixed	0.295	0.278	0.255	0.288	0.278	0.268	0.292	0.278	0.282
Variable-fixed	0.359	0.36	0.365	0.344	0.36	0.387	0.359	0.36	0.347
Variable-variable	0.346	0.361	0.38	0.367	0.361	0.345	0.349	0.361	0.371

Sensitivity to preference parameters

	Panel A			Panel B			Panel C		
	$\beta = 0.93$	$\beta = 0.95$	$\beta = 0.97$	$\gamma = 5$	$\gamma = 10$	$\gamma = 15$	$\psi = 0.6$	$\psi = 0.75$	$\psi = 0.9$
Av. cons growth	0.044	0.045	0.048	0.033	0.045	0.067	0.045	0.045	0.044
Std. cons growth	0.231	0.232	0.238	0.243	0.232	0.296	0.227	0.232	0.243
Savings	163.053	172.087	183.206	129.284	172.087	194.079	183.53	172.09	164.35
Mtg. type proportion:									
Fixed-fixed	0.295	0.278	0.255	0.288	0.278	0.268	0.292	0.278	0.282
Variable-fixed	0.359	0.36	0.365	0.344	0.36	0.387	0.359	0.36	0.347
Variable-variable	0.346	0.361	0.38	0.367	0.361	0.345	0.349	0.361	0.371

Sensitivity to preference parameters

	Panel A			Panel B			Panel C		
	$\beta = 0.93$	$\beta = 0.95$	$\beta = 0.97$	$\gamma = 5$	$\gamma = 10$	$\gamma = 15$	$\psi = 0.6$	$\psi = 0.75$	$\psi = 0.9$
Av. cons growth	0.044	0.045	0.048	0.033	0.045	0.067	0.045	0.045	0.044
Std. cons growth	0.231	0.232	0.238	0.243	0.232	0.296	0.227	0.232	0.243
Savings	163.053	172.087	183.206	129.284	172.087	194.079	183.53	172.09	164.35
Mtg. type proportion:									
Fixed-fixed	0.295	0.278	0.255	0.288	0.278	0.268	0.292	0.278	0.282
Variable-fixed	0.359	0.36	0.365	0.344	0.36	0.387	0.359	0.36	0.347
Variable-variable	0.346	0.361	0.38	0.367	0.361	0.345	0.349	0.361	0.371

Counterfactual worlds * - welfare

		High Rf		Low Rf	
	Unconditional	High TP	Low TP	High TP	Low TP
FF only	-0.0248	-0.0391	-0.0171	-0.0288	-0.0143
VF only	-0.0139	-0.0076	-0.0219	-0.0078	-0.0181
VV only	-0.0146	-0.0097	-0.0239	-0.0073	-0.0176

Counterfactual worlds * - Income, Wealth and Leverage

Age	Inc	Consumption				Financial wealth				Leverage			
		All	FF	VF	VV	All	FF	VF	VV	All	FF	VF	VV
26 - 30	100.9	45.5	44.7	45.0	45.0	185.4	185.4	186.7	187.1	218.7	219.5	218.8	218.8
31 - 35	119.4	72.9	71.9	72.8	72.7	262.3	263.3	264.0	264.6	186.7	189.4	187.6	187.5
36 - 40	134.7	90.6	89.8	90.7	90.6	293.8	295.4	294.6	295.7	148.0	151.8	149.3	149.1
41 - 45	145.4	99.2	98.6	99.0	99.1	305.1	306.2	304.5	306.3	100.5	104.2	101.7	101.6
46 - 50	150.4	105.8	105.3	105.6	105.7	306.1	306.6	305.9	306.4	41.6	43.4	42.1	42.1
51 - 55	149.0	114.0	113.8	113.8	114.0	304.3	304.2	304.0	304.4	0.0	0.0	0.0	0.0
56 - 60	141.8	111.9	111.8	111.9	111.9	310.0	310.1	310.0	310.0	0.0	0.0	0.0	0.0
61 - 65	129.3	101.6	101.6	101.6	101.6	320.4	320.6	320.4	320.4	0.0	0.0	0.0	0.0

Counterfactual worlds * - Mean and volatility of consumption and mortgage payments

	All	FF only	VF only	VV only
Av. consumption growth	0.045	0.046	0.047	0.048
Std. consumption growth	0.232	0.225	0.238	0.228
Av. interest payments	6.436	7.251	6.692	6.629
Std. interest payments	5.316	5.259	5.647	5.549
Av. total payments	15.649	16.459	15.909	15.836
Std. total payments	4.157	3.902	4.583	4.220