Table 1 Microeconomic Model Calibration

Calibrated Parameters			
Description	Parameter	Value	Source
Permanent Income Growth Factor	Γ	1.03	PSID: Carroll (1992)
Interest Factor	R	1.04	Conventional
Time Preference Factor	β	0.96	Conventional
Coefficient of Relative Risk Aversion	ρ	2	Conventional
Probability of Zero Income	$\wp$	0.005	PSID: Carroll (1992)
Std Dev of Log Permanent Shock	σ_{ψ}	0.1	PSID: Carroll (1992)
Std Dev of Log Transitory Shock	σ_{θ}	0.1	PSID: Carroll (1992)

Table 2 Model Characteristics Calculated from Parameters

Description	Symbol and Formula			Approximate Calculated Value
Finite Human Wealth Factor	$\mathcal{R}^{-1}$	$\equiv$	Γ/R	0.990
PF Finite Value of Autarky Factor	$\beth$	$\equiv$	$\beta\Gamma^{1-\rho}$	0.932
Growth Compensated Permanent Shock	$\underline{\psi}$	$\equiv$	$(\mathbb{E}[\psi^{-1}])^{-1}$	0.990
Uncertainty-Adjusted Growth	$\underline{\Gamma}$	$\equiv$	$\Gamma\underline{\psi}$	1.020
Utility Compensated Permanent Shock	$\underline{\underline{\psi}}$	$\equiv$	$(\mathbb{E}[\psi^{1-\rho}])^{1/(1-\rho)}$	0.990
Utility Compensated Growth	$\underline{\underline{\Gamma}}$	$\equiv$	$\Gamma\underline{\underline{\psi}}$	1.020
Absolute Patience Factor	Þ	$\equiv$	$(\mathsf{R}\beta)^{1/\rho}$	0.999
Return Patience Factor	Þ_{R}	$\equiv$	$\text{Þ}/\mathsf{R}$	0.961
Growth Patience Factor	Þ_{Γ}	$\equiv$	$\text{Þ}/\Gamma$	0.970
NormalizedGrowth Patience Factor	$\text{Þ}_{\underline{\Gamma}}$	$\equiv$	$\text{Þ}/\underline{\Gamma}$	0.980
Finite Value of Autarky Factor	$\underline{\underline{\beth}}$	$\equiv$	$\beta\Gamma^{1-\rho}\underline{\underline{\psi}}^{1-\rho}$	0.941
Weak Impatience Factor	$\wp^{1/\rho}\text{Þ}$	$\equiv$	$(\wp\beta\mathsf{R})^{1/\rho}$	0.071

Table 3 Definitions and Comparisons of Conditions

<table>
<tr><td>Perfect Foresight Versions</td><td>Uncertainty Versions</td></tr>
<tr><td colspan="2">Finite Human Wealth Condition (FHWC)</td></tr>
<tr><td>$\Gamma/\mathsf{R} < 1$

The growth factor for permanent income Γ must be smaller than the discounting factor R for human wealth to be finite.</td><td>$\Gamma/\mathsf{R} < 1$

The model's risks are mean-preserving spreads, so the PDV of future income is unchanged by their introduction.</td></tr>
<tr><td colspan="2">Absolute Impatience Condition (AIC)</td></tr>
<tr><td>$\text{Þ} < 1$

The unconstrained consumer is sufficiently impatient that the level of consumption will be declining over time:

$\mathbf{c}_{t+1} < \mathbf{c}_t$</td><td>$\text{Þ} < 1$

If wealth is large enough, the expectation of consumption next period will be smaller than this period's consumption:

$\lim_{m_t \rightarrow \infty} \mathbb{E}_t[\mathbf{c}_{t+1}] < \mathbf{c}_t$</td></tr>
<tr><td colspan="2">Return Impatience Conditions</td></tr>
<tr><td>Return Impatience Condition (RIC)</td><td>Weak RIC (WRIC)</td></tr>
<tr><td>$\text{Þ}/\mathsf{R} < 1$

The growth factor for consumption Þ must be smaller than the discounting factor R, so that the PDV of current and future consumption will be finite:

$\mathrm{c}'(m) = 1 - \text{Þ}/\mathsf{R} < 1$</td><td>$\wp^{1/\rho}\text{Þ}/\mathsf{R} < 1$

If the probability of the zero-income event is $\wp = 1$ then income is always zero and the condition becomes identical to the RIC. Otherwise, weaker.

$\mathrm{c}'(m) < 1 - \wp^{1/\rho}\text{Þ}/\mathsf{R} < 1$</td></tr>
<tr><td colspan="2">Growth Impatience Conditions</td></tr>
<tr><td>GIC</td><td>GIC-Nrm</td></tr>
<tr><td>$\text{Þ}/\Gamma < 1$

For an unconstrained PF consumer, the ratio of $\mathbf{c}$ to $\mathbf{p}$ will fall over time. For constrained, guarantees the constraint eventually binds. Guarantees $\lim_{m_t \uparrow \infty} \mathbb{E}_t[\psi_{t+1} m_{t+1}/m_t] = \text{Þ}_\Gamma$</td><td>$\text{Þ}\,\mathbb{E}[\psi^{-1}]/\Gamma < 1$

By Jensen's inequality stronger than GIC Ensures consumers will not expect to accumulate m unboundedly.

$\lim_{m_t \rightarrow \infty} \mathbb{E}_t[m_{t+1}/m_t] = \text{Þ}_{\underline{\Gamma}}$</td></tr>
<tr><td colspan="2">Finite Value of Autarky Conditions</td></tr>
<tr><td>PF-FVAC</td><td>FVAC</td></tr>
<tr><td>$\beta\Gamma^{1-\rho} < 1$
equivalently $\text{Þ} < \mathsf{R}^{1/\rho}\Gamma^{1-1/\rho}$

The discounted utility of constrained consumers who spend their permanent income each period should be finite.</td><td>$\beta\Gamma^{1-\rho}\,\mathbb{E}[\psi^{1-\rho}] < 1$

By Jensen's inequality, stronger than the PF-FVAC because for $\rho > 1$ and nondegenerate ψ, $\mathbb{E}[\psi^{1-\rho}] > 1$.</td></tr>
</table>

Table 4 Sufficient Conditions for Nondegenerate[‡] Solution

$\mathrm{c}(m)$: Model Reference	Conditions	Comments or or Logic
$\bar{\mathrm{c}}(m)$: PF Unconstrained	RIC, FHWC°	RIC $\Rightarrow \lvert \mathrm{v}(m) \rvert < \infty$; FHWC $\Rightarrow 0 < \lvert \mathrm{v}(m) \rvert$
$\underline{\mathrm{c}}(m) = \underline{\kappa} m$: PF $h = 0$		PF model with no human wealth
Section 1.4.2		RIC prevents $\bar{\mathrm{c}}(m) = \underline{\mathrm{c}}(m) = 0$
Section 1.4.2		FHWC prevents $\bar{\mathrm{c}}(m) = \infty$
Eq (26)		PF-FVAC+FHWC $\Rightarrow$ RIC
Eq (27)		GIC+FHWC $\Rightarrow$ PF-FVAC
$\grave{\mathrm{c}}(m)$: PF Constrained	~~GIC~~, RIC	FHWC holds ($\Gamma < \text{Þ} < \mathsf{R} \Rightarrow \Gamma < \mathsf{R}$)
Section 1.4.3		$\grave{\mathrm{c}}(m) = \bar{\mathrm{c}}(m)$ for $m > m_{\#} < 1$
		(~~RIC~~ would yield $m_{\#} = 0$ so $\grave{\mathrm{c}}(m) = 0$)
Appendix A	GIC,RIC	$\lim_{m \to \infty} \grave{\mathrm{c}}(m) = \bar{\mathrm{c}}(m), \lim_{m \to \infty} \grave{\boldsymbol{\kappa}}(m) = \underline{\kappa}$
		kinks at pts where horizon to $b = 0$ changes*
Appendix A	GIC,~~RIC~~	$\lim_{m \to \infty} \grave{\boldsymbol{\kappa}}(m) = 0$
		kinks at pts where horizon to $b = 0$ changes*
$\mathring{\mathrm{c}}(m)$: Friedman/Muth	Section 2.1,	$\underline{\mathrm{c}}(m) < \mathring{\mathrm{c}}(m) < \bar{\mathrm{c}}(m)$
	Section 2.2	$\underline{\mathrm{v}}(m) < \mathring{\mathrm{v}}(m) < \bar{\mathrm{v}}(m)$
Section 1.9	FVAC, WRIC	Sufficient for Contraction
Section 1.11.1		WRIC is weaker than RIC
Figure 3		FVAC is stronger than PF-FVAC
Section 1.11.3		~~FHWC~~+RIC $\Rightarrow$GIC, $\lim_{m \to \infty} \mathring{\boldsymbol{\kappa}}(m) = \underline{\kappa}$
Section 1.11.2		~~RIC~~ $\Rightarrow$~~FHWC~~, $\lim_{m \to \infty} \mathring{\boldsymbol{\kappa}}(m) = 0$
Section 2.3		"Buffer Stock Saving" Conditions
Section 2.3.2		GIC $\Rightarrow \exists \quad 0 < \hat{m} < \infty$: Steady-State
Section 2.3.1		GIC-Nrm $\Rightarrow \exists \quad 0 < \check{m} < \infty$: Target

[‡]For feasible m satisfying $0 < m < \infty$, a nondegenerate limiting consumption function defines a unique optimal value of c satisfying $0 < c(m) < \infty$; a nondegenerate limiting value function defines a corresponding unique value of $-\infty < \mathrm{v}(m) < 0$. °RIC, FHWC are necessary as well as sufficient for the perfect foresight case. *That is, the first kink point in $c(m)$ is $m_{\#}$ s.t. for $m < m_{\#}$ the constraint will bind now, while for $m > m_{\#}$ the constraint will bind one period in the future. The second kink point corresponds to the m where the constraint will bind two periods in the future, etc. **In the Friedman/Muth model, the RIC+FHWC are sufficient, but *not* necessary for nondegeneracy

Table 5 Taxonomy of Perfect Foresight Liquidity Constrained Model Outcomes

For constrained $\grave{c}$ and unconstrained $\bar{\mathrm{c}}$ consumption functions

Main Condition Subcondition	Math	Outcome, Comments or Results
~~GIC~~	$1 < \text{Þ}/\Gamma$	Constraint never binds for $m \geq 1$
and RIC	$\text{Þ}/\mathsf{R} < 1$	FHWC holds ($\mathsf{R} > \Gamma$); $\grave{\mathrm{c}}(m) = \bar{\mathrm{c}}(m)$ for $m \geq 1$
and ~~RIC~~	$1 < \text{Þ}/\mathsf{R}$	$\grave{\mathrm{c}}(m)$ is degenerate: $\grave{\mathrm{c}}(m) = 0$
GIC	$\text{Þ}/\Gamma < 1$	Constraint binds in finite time for any m
and RIC	$\text{Þ}/\mathsf{R} < 1$	FHWC may or may not hold $\lim_{m\uparrow\infty} \bar{\mathrm{c}}(m) - \grave{\mathrm{c}}(m) = 0$ $\lim_{m\uparrow\infty} \grave{\boldsymbol{\kappa}}(m) = \underline{\kappa}$
and ~~RIC~~	$1 < \text{Þ}/\mathsf{R}$	~~FHWC~~ $\lim_{m\uparrow\infty} \grave{\boldsymbol{\kappa}}(m) = 0$

Conditions are applied from left to right; for example, the second row indicates conclusions in the case where ~~GIC~~ and RIC both hold, while the third row indicates that when the GIC and the RIC both fail, the consumption function is degenerate; the next row indicates that whenever the GIC holds, the constraint will bind in finite time.