A Model of the Consumption Response to Fiscal Stimulus Payments

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Overview

1. Introduction
2. The 2001 tax rebate
3. The model
4. Wealthy hand-to-mouth consumers
5. Calibration
6. The tax rebate experiment
7. Role of aggregate economic conditions
8. Implications for stimulus policy design
9. Concluding remarks
Motivation and research question

- Fiscal stimulus payments have been used in the U.S. in the last two downturns: 2001 and 2007-2009.
- It has been convincingly shown that households spend approximately 25% of rebates on non durables within the same quarter (they call this the rebate coefficient).
- However, standard models in consumption theory predict that transitory income fluctuations (like tax rebates) should have a negligible effect.

Can a model featuring liquid and illiquid wealth account for this strong rebate coefficient?
Main characteristics and contribution

Brief description:

- Two types of assets: liquid and illiquid.
- Illiquid assets pay an exogenously higher rate of return, but can only be accessed by paying a transaction cost.
- An important type of agent arises: wealthy hand-to-mouth.
- Size-asymmetry.

Contributions:

- Using data from the 2001 Survey of Consumer Finances they claim that 1/3 of U.S. households are wealthy hand-to-mouth.
- Experiments to find the optimal design of fiscal policy (strongest bang for the buck).
- Microfoundations for Campbell and Mankiw’s spender-saver model.
Three salient characteristics

1. Essentially lump sum: almost every household received $300 per adult.
2. Anticipated.
3. Timing of receipt was random (based on the last two digits of the Social Security number).
Empirical evidence

Baseline specification

\[ \Delta c_{it} = \sum_s \beta_0 s_{month} + \beta'_1 X_{i,t-1} + \beta_2 R_{it} + \epsilon_{it} \]

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<tr>
<td>JPS 2006, 2SLS (N = 13,066)</td>
<td>0.375 (0.136)</td>
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<tr>
<td>Trim top &amp; bottom 0.5%, 2SLS (N = 12,935)</td>
<td>0.237 (0.093)</td>
</tr>
<tr>
<td>Trim top &amp; bottom 1.5%, 2SLS (N = 12,679)</td>
<td>0.219 (0.079)</td>
</tr>
<tr>
<td>MS 2011, IVQR (N = 13,066)</td>
<td>0.244 (0.057)</td>
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Figure: Estimates of the 2001 rebate coefficient
Baseline specification

\[ \beta_2 = \frac{(\Delta c^A_{Q_2} - \Delta c^B_{Q_2}) + (c^B_{Q_3} - \Delta c^A_{Q_3})}{2} \]

Figure: Economic interpretation of \( \beta_2 \) under alternative information structures
Model description

**Demographics**  Stationary economy with a continuum of households indexed by $i$, age indexed by $j = 1, \ldots, J$, with retirement age $J^w$ that lasts $J^r$ periods.

**Preferences**    Epstein-Zin-Weil objective function

$$V_{ij} = \left[ (1 - \beta) \left( c_{ij}^{\phi} s_{ij}^{1-\phi} \right)^{1-\sigma} + \beta \left\{ E_j \left[ V_{i,j+1}^{1-\gamma} \right] \right\}^{\frac{1-\sigma}{1-\gamma}} \right]^{\frac{1}{1-\sigma}}$$

**Idiosyncratic earnings**  $\log y_{ij} = \chi_j + \alpha_i + z_{ij}$.

**Assets**  Liquid asset $m_{ij}$ and illiquid asset $a_{ij}$ with rates of return $\frac{1}{q^m}$ and $\frac{1}{q^a}$. Transaction cost $\kappa$. Borrowing in the liquid asset is allowed up to ad-hoc limit $m_{j+1}(y_{ij})$, but illiquid assets have to be non-negative, e.g. $a_{ij} \geq 0$. Moreover, $s_{ij} = \zeta a_{ij} + h_{ij}$ with $h_{ij} \geq -\zeta a_{ij}$.

**Government**  Has expenditures $G$, gives social security benefits $p(\chi_{J^w}, \alpha_i, z_{iJ^w})$, taxes consumption ($\tau_c$), asset income ($\tau^a, \tau^m$), and labor income $\tau^y(y_{ij})$. Issues one-period bonds $B$ at price $q^g$. 

Kaplan, Violante  Fiscal Stimulus Response
Household problem  The vector of states is $s_j = (m_j, a_j, \alpha, z_j)$. The value function at age $j$ is $V_j(s_j) = \max \left\{ V_j^0(s_j), V_j^1(s_j) \right\}$.

$$V_j^0(s_j) = \max_{c_j, h_j, m_{j+1}} \left[ (1 - \beta) \left( c_j s_j \right)^{1-\phi} + \beta \left\{ E_j \left[ V_{i,j+1}^{1-\gamma} \right] \right\} \right]^{\frac{1-\sigma}{1-\gamma}}$$

subject to

$$(1 + \tau_c) (c_j + h_j) + q_m (m_{j+1}) m_{j+1} = y_j + m_j - \tau (y_j, a_j, m_j)$$

$s_j = h_j + \zeta a_j$

$q^a a_{j+1} = a_j$

$c_j \geq 0, \quad h_j \geq -\zeta a_j, \quad m_{j+1} \geq -m_{j+1}(y_j)$

$$y_j = \begin{cases} \exp (\chi_j + \alpha + z_j) & \text{if } j \leq J^w \\ p (\chi_{J^w} m, \alpha, z_{J^w}) & \text{otherwise} \end{cases}$$
Model description

\[ V^1_j(s_j) = \max_{c_j, h_j, m_{j+1}, a_{j+1}} \left[(1 - \beta) \left(c_{ij}^\phi s_{ij}^{1-\phi}\right)^{1-\sigma} + \beta \left\{ E_j \left[V^{1-\gamma}_{i,j+1}\right]\right\}^{\frac{1-\sigma}{1-\gamma}}\right]^{\frac{1}{1-\sigma}} \]

subject to

\[(1 + \tau_c)(c_j + h_j) + q_m(m_{j+1}) m_{j+1} + q^a a_{j+1} = y_j + m_j + a_j - \kappa - \]

\[s_j = h_j + \zeta a_j \]

\[q^a a_{j+1} = a_j \]

\[c_j \geq 0, \quad h_j \geq -\zeta a_j, \quad m_{j+1} \geq -m_{j+1}(y_j) \]

\[y_j = \begin{cases} 
\exp(\chi_j + \alpha + z_j) & \text{if } j \leq J^w \\
p(\chi_{J^w m}, \alpha, z_{J^w}) & \text{otherwise}
\end{cases} \]
Balanced budget  The government respects its intertemporal budget constraint,

\[ G + \sum_{j=J^w+1}^J \int p(y_{jw}) \, d\mu_j + \left( \frac{1}{q_g} - 1 \right) B = \tau_c \sum_{j=1}^J \int c_j \, d\mu_j + \sum_{j=1}^J \int \tau(y_j, a_j, m_j) \, d\mu_j \]
Poor hand-to-mouth in the model

**Figure:** Example of life cycle of a poor hand-to-mouth agent in the model
Wealthy hand-to-mouth in the model

Figure: Example of life cycle of a wealthy hand-to-mouth agent in the model
Hand-to-mouth in the data

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<tbody>
<tr>
<td>Earnings plus benefits (age 22-59)</td>
<td>41,000</td>
<td>52,745</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Net worth</td>
<td>62,442</td>
<td>150,411</td>
<td>0.90</td>
<td>1.7</td>
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<tr>
<td>Net liquid wealth</td>
<td></td>
<td></td>
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<tr>
<td>Cash, checking, saving, MM accounts</td>
<td>2,629</td>
<td>31,001</td>
<td>0.77</td>
<td>-1.5</td>
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<td>Directly held MF, stocks, bonds, T-Bills</td>
<td>0</td>
<td>19,920</td>
<td>0.29</td>
<td>1.7</td>
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<tr>
<td>Revolving credit card debt</td>
<td>0</td>
<td>1,575</td>
<td>0.41</td>
<td>–</td>
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<tr>
<td>Net illiquid wealth</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Housing net of mortgages</td>
<td>54,600</td>
<td>119,409</td>
<td>0.93</td>
<td>2.3</td>
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<td>Retirement accounts</td>
<td>31,000</td>
<td>72,592</td>
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<td>2.0</td>
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<td>Life insurance</td>
<td>950</td>
<td>34,455</td>
<td>0.53</td>
<td>3.5</td>
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<tr>
<td>Certificates of deposit</td>
<td>0</td>
<td>7,740</td>
<td>0.27</td>
<td>0.1</td>
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<tr>
<td>Saving bonds</td>
<td>0</td>
<td>3,807</td>
<td>0.14</td>
<td>0.9</td>
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**Figure:** Household portfolio composition based on the 2001 Survey of Consumer Finances SCF
Measurment of hand-to-mouth in the data

- Ideally measured as households that do not carry liquid wealth across periods.
- Actually measured as those whose average balance of liquid wealth is equal to or less than half their earnings per pay-period. Biased downward (why?).
- HtM at the credit limit are those with negative holdings of liquid wealth lower than half their pay-period earnings minus their self-reported credit limit.
- Wealthy HtM are those who satisfy above requirements and have positive illiquid wealth (alternatively for robustness at least $3000).

Between 17.5% and 35% of households are HtM in the U.S. Among these, between 40 and 80 percent are wealthy HtM (7-26% of whole population). They choose to target 1/3 of the population to be HtM in the model.
Calibration

Demographic and initial asset positions  Quarterly frequency, with \( j = 1 \) at age 22, \( j = J^w \) at age 60 and \( J' = 80 \) (20 years). Target SCF observed wealth portfolios of households aged 20 to 24, and correlation between initial earnings, liquid and illiquid wealth.

Preferences  Discount factor \( \beta \) calibrated to replicate median illiquid wealth as a fraction of average income in the SCF, \( \beta = 0.941 \). Other coefficients are \( \gamma = 4, \frac{1}{\sigma} = 1.5, \phi = 0.85 \) (match the ratio of housing to total expenditures) and \( \zeta = 0.01 \).

Earnings process  Calibrated to PSID.

Asset returns  For liquid wealth is \(-1.48\%\) and \(2.29\%\) for illiquid.
Credit limit and borrowing rate: Credit limit from self-reported one in SCF, arround 74% of quarterly labor income. The interest rate of unsecured debt is set to reproduce the fraction of borrowers in the data, arround 6%.

Transaction cost: Set $\kappa = $1000 to match the proportion of HtM households in data.

Taxes and social security benefits: Various sources.

One-asset model: They also calibrate a one asset model.
Figure: Features of the model by transaction cost
Comparisson with the one asset model

**Figure:** Life cycle of the two and one asset models
Baseline results

Figure: Rebate coefficient and MPC by transaction cost
### Alternative information structures

<table>
<thead>
<tr>
<th></th>
<th>$\Delta c_{Q2}^A$</th>
<th>$\Delta c_{Q2}^B$</th>
<th>$\Delta c_{Q3}^A$</th>
<th>$\Delta c_{Q3}^B$</th>
<th>$\beta_2$</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>0.20</td>
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<td>-0.09</td>
<td>0.07</td>
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<td>Anticipated by all</td>
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<td>0.00</td>
<td>-0.08</td>
<td>0.07</td>
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<td>Surprise for all</td>
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<td>0.00</td>
<td>-0.09</td>
<td>0.20</td>
<td>0.25</td>
</tr>
</tbody>
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**Figure:** Breakdown of the model’s rebate coefficient
Figure: Rebate coefficients under alternative assumptions
Heterogeneity

Figure: Heterogeneity in rebate coefficients in the model ($\kappa = $1000)

(a) Distribution of rebate coefficients in the population

(b) Median earnings by quintile of rebate coefficient distribution

Figure: Heterogeneity in rebate coefficients in the model ($\kappa = $1000)
Figure: Rebate coefficients by stimulus payment size
Role of aggregate economic conditions

Figure: Effect of tax reform and aggregate economic conditions
Aggregate impact

**Figure:** Cumulative aggregate impact of the policy measured as total rebate outlays spent on nondurable consumption

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<tbody>
<tr>
<td>Baseline</td>
<td>0</td>
<td>0.13</td>
<td>0.22</td>
<td>0.28</td>
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<tr>
<td>Anticipated by all</td>
<td>0.06</td>
<td>0.19</td>
<td>0.26</td>
<td>0.30</td>
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<tr>
<td>Surprise for all</td>
<td>0</td>
<td>0.10</td>
<td>0.25</td>
<td>0.32</td>
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Stimulus policy design

Figure: Alternative designs of fiscal stimulus policies

(a) Experiment on the size of the stimulus payment
(b) Experiment on the income-targeting of the stimulus payment
Concluding remarks

Where to go from here?

- Analyze the 2008 fiscal stimulus: larger, more targeted, more severe recession and not part of a broader tax reform.
- This can be seen as a (microfounded) second generation of Campbell and Mankiw’s spender-saver model, and as such it may be better equipped to deal with the first generation’s shortcomings.
- Take into account general equilibrium effect on prices.
The End