Consumer revolving credit and debt over the life-cycle and business cycle

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The views expressed in this paper are the author’s and do not necessarily reflect the official position of the Federal Reserve Bank of Boston or the Federal Reserve System.
Overview

- Motivation
- Literature
- Data
- Empirical results
- Theory and estimation
  - Identification of convenience use vs. revolving
  - Credit limit and debt dynamics
- Conclusions and future research
Consumer revolving credit

Source: Author’s calculations from BEA NIPA Tables and Fed Board G.19 Statistical Releases.
Sources of liquidity for payments

Source: Author's calculations from Equifax/CCP, Survey of Consumer Payment Choice (SCPC), Survey of Currency and Transaction Account Usage (SCTAU), and Fed Board H.6 Releases.
Sources: Carroll and Samwick (1997), Fulford (2015a, JME), authors’ calculations from Equifax/CCP and BEA NIPA Tables.
Abbreviated Literature Review

- Household finance is important
  - Campbell (2006), Zinman (forthcoming)
- Credit cards as a source of revolving credit
- Credit cards as a payment instrument
## Data Sources

<table>
<thead>
<tr>
<th></th>
<th>NY Fed/CCP</th>
<th>SCPC</th>
<th>SCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Quarterly</td>
<td>Annual</td>
<td>Triannual</td>
</tr>
<tr>
<td>Unit of Obs</td>
<td>Consumers</td>
<td>Consumers</td>
<td>Households</td>
</tr>
<tr>
<td>Sponsor</td>
<td>Equifax</td>
<td>Boston Fed</td>
<td>Fed Board</td>
</tr>
<tr>
<td>Sample size</td>
<td>15 mil (5% sample of all Equifax credit accounts)</td>
<td>~2,000</td>
<td>~30,000</td>
</tr>
</tbody>
</table>

### Summary
- **NY Fed/CCP**: Full credit history for each account (aggregate by debt type, plus mortgage trade lines).
- **SCPC**: Consumer preferences, adoption, and use of payment options.
- **SCF**: Household assets and liabilities, income.
Combinations of consumer debt, summary

Debt bundles

Share of Consumers

CreditOnly

Others

Mortgage

Share of Debt

Source: Authors’ calculations from Equifax/CCP.

<table>
<thead>
<tr>
<th>Empirical Results</th>
<th>Credit and debt</th>
<th>Fulford and Schuh</th>
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<td>-8-</td>
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</tbody>
</table>
Combinations of consumer debt, mortgage adopters

Debt bundles among mortgage adopters

Source: Authors’ calculations from Equifax/CCP.

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<th>Empirical Results</th>
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</table>
Combinations of consumer debt, non-mortgage adopters

Debt bundles among non-mortgage adopters with some debt

Source: Authors’ calculations from Equifax/CCP.

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<td>-10</td>
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</table>
Credit limits and debts vary over time, utilization does not.

Source: Author's calculations from Equifax/CCP.
Credit limits and debts increase with age

Source: Author’s calculations from Equifax/CCP.
Credit utilization decreases slowly

Source: Author’s calculations from Equifax/CCP.

Empirical Results Credit and debt Fulford and Schuh -13-
Distributions of utilization by age

All ages

Age 20-30

Age 30-40

Age 40-50

Age 50-60

Age 60-80

Source: Author’s calculations from Equifax/CCP.
A little theory

- **Convenience users**: Past debts or utilization not predictive of future utilization

\[ D_{i,t} = \omega_{i,t} C_{i,t} \]

Credit utilization \( i,t \) = \( D_{i,t} / B_{i,t} = \omega_{i,t} C_{i,t} / B_{i,t} \)

- **Revolvers**: Past debts or utilization predict future debts and utilization. Accumulation equation:

\[ D_{t+1} = (1 + r)(D_t + C_t - Y_t) \]

- Any observation could be coming from either a Revolver or Convenience user.
- Use theory to distinguish which is more probable
A little estimation

- Convenience users and revolvers are not identified in the data.
- Assume convenience users essentially do not respond to limits.
  - Based on the assumption, can estimate probabilities that an individual in the Equifax/CCP data is a convenience user vs. revolver, based on the time series of their past limits and debts.
- Further impose the SCF conditional likelihood of revolving/convenience based on credit utilization and age to be the same as those estimated in Equifax/CCP.
- To implement estimation, use an expectation maximization (EM) procedure, to infer/identify convenience use and revolving.
Credit utilization by convenience users and revolvers

Notes: Linear age trend is from fixed effects. Colinearity of age-cohort-year effects means the linear trend can be in any of them. Source: Author’s calculations from Equifax/CCP.
Credit utilization results

Credit utilization\(_{it}\) = \(\theta_t + \theta_a + \alpha_i + \beta\) Credit utilization\(_{i,t-1}\) + \(\epsilon_{it}\)

<table>
<thead>
<tr>
<th>Credit utilization(_{t-1})</th>
<th>All</th>
<th>All</th>
<th>All</th>
<th>All</th>
<th>All</th>
<th>Revolver</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.874***</td>
<td>0.868***</td>
<td>0.647***</td>
<td>0.647***</td>
<td>0.514***</td>
<td>0.766***</td>
<td></td>
</tr>
<tr>
<td>(0.000876)</td>
<td>(0.000892)</td>
<td>(0.00131)</td>
<td>(0.00139)</td>
<td>(0.00441)</td>
<td>(0.00125)</td>
<td></td>
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<tr>
<td>Credit utilization(_{t-2})</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0156***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.000643)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Credit util(_{t-1}) × Age</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>0.00314***</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(9.93e-05)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.0479***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(0.000461)</td>
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| Observations | 347,642 | 347,642 | 347,642 | 332,696 | 347,642 | 238,111 |
| R-squared     | 0.741   | 0.743   | 0.429   | 0.444   | 0.431   | 0.616   |
| Fixed effects | No      | No      | Yes     | Yes     | Yes     | Yes     |
| Age and year effects | No   | Yes     | Yes     | Yes     | Yes     | Yes     |
| Number of accounts | 10,451 | 10,103  | 10,451  |       |       |         |
| Frac. Variance from FE   | 0.477   | 0.467   | 0.498   |       |       |         |

Source: Author’s calculations from Equifax/CCP.
Credit and debt regressions

\[ \log \text{Debt}_{it} = \theta_i + \theta_t + \theta_a + \alpha \log \text{Limit}_{i,t-1} + \beta \log \text{Debt}_{i,t-1} + \epsilon_{it} \]

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</thead>
<tbody>
<tr>
<td>Log Debt(_{t-1})</td>
<td>0.505*** (0.00157)</td>
<td>0.758*** (0.00119)</td>
<td>0.604*** (0.00132)</td>
<td>0.861*** (0.000593)</td>
<td>0.00687*** (0.000561)</td>
<td>-0.0141*** (0.000580)</td>
<td>0.0240*** (0.000616)</td>
</tr>
<tr>
<td>Log Credit Limit(_{t-1})</td>
<td>0.414*** (0.00262)</td>
<td>0.134*** (0.00148)</td>
<td>0.313*** (0.00243)</td>
<td>0.130*** (0.000787)</td>
<td>0.848*** (0.000933)</td>
<td>0.736*** (0.00114)</td>
<td>0.903*** (0.000807)</td>
</tr>
</tbody>
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Observations: 296,369 296,369 361,280 293,014
R-squared: 0.432 0.667 0.610 0.926
Accounts: 10,028 10,718 10,718
Fixed effects: Yes No Yes Yes
Zero included: No No Yes No
Age effects: Yes Yes Yes Yes
Long-term credit impact: 0.862 0.875 0.879 0.990
Credit salience \(\sigma\): 0.443 0.665 0.530 0.756

Source: Author's calculations from Equifax/CCP.
Interactions with utilization and age for Revolvers

One quarter impact 1% change in limit

One quarter impact 1% change in debt

Source: Author's calculations from Equifax/CCP.
Interactions with utilization and age for Revolvers

Long term impact 1% change in limit

Source: Author’s calculations from Equifax/CCP.
Summary of results

- Aggregate utilization of credit is essentially acyclical.
- Average utilization starts at \( \sim 50\% \) (age 20) and drops to \( \sim 20\% \) (age 60).
  - Convenience users have lower, more stable utilization over lifetime.
  - Revolvers have higher, declining utilization over lifetime.
  - Transition of some revolvers to convenience users is an important dynamic of average lifecycle utilization.
- Revolvers adjust their debt to changes in credit limits essentially one-for-one within two years.
  - Assumes convenience users essentially do not respond to limits.
- Future research:


References II

