The Liquid Hand-to-Mouth: Evidence from Personal Finance Management Software

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Motivation

- Payday effects: (some) people’s spending increases the day they are paid

The only day better than Friday is payday!
Relevant literature

- Empirical studies that document consumption responses to disposable income:
  - Micro level: Parker (1999), Souleles (1999), Shapiro and Slemrod (2003a), Shapiro and Slemrod (2003b), Shapiro and Slemrod (2009), Johnson et al. (2006), Parker et al. (2013), Broda and Parker (2014), and Gelman et al. (2014)
  - Macro level: Campbell and Mankiw (1989, 1990)

- Theoretical studies explaining spending responses with illiquid savings and liquidity constraints:
  - Laibson et al. (2012): hyperbolic discounting preferences induce agents to lock their wealth
  - Kaplan and Violante (2014): the “wealthy hand-to-mouth” hold plenty illiquid wealth but no liquid wealth
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Outline

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3. We show that individuals’ liquidity and cash holdings are at least three times larger than predicted by economic models
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2. We show that less than 3 percent of individuals have less than one day of spending left in cash or liquidity before their paychecks
3. We show that individuals’ liquidity and cash holdings are at least three times larger than predicted by economic models
4. We then look at cash holding responses to income payments to detect insufficient cash cushions and future liquidity constraints inspired by the corporate finance literature
The financial aggregation app: overview

- We use a new and very accurate panel dataset of spending and income from the actual transactions data recorded by a financial aggregation and service app in Iceland from 2011 to 2015.
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    - Icelanders (almost) never use cash
    - App is marketed through banks and we have a fairly representative sample
    - Income and spending are pre-categorized
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    - Icelanders (almost) never use cash
    - App is marketed through banks and we have a fairly representative sample
    - Income and spending are pre-categorized
  - We also observe overdraft and credit limits
The financial aggregation app: screenshots

Edit Profile
- Gender
- Year of birth: 1984
- Adults: 1
- Children: 0
- House: 100 m²
- Bedrooms: 0
- Cars: 0

Transactions
- Wednesday, September 16
  - TAXI DAMIAN: Taxis & Public Transportation - 4,454 kr.
  - Metrostation Islands B: Planes, Trains and Automobile - 713 kr.
- Tuesday, September 15
  - Millfær: Tollstjóri: Taxes (+ and -) - 33,341 kr.
- Monday, September 14
  - FOETEX FISKETORVET: Groceries - 732 kr.
- Sunday, September 13
  - NETTO AXEL HEIDESG: Groceries - 78 kr.
- Saturday, September 12
  - NETTO AXEL HEIDESG: Groceries - 263 kr.

Feed
- Search
  - Current: 1,134,157 kr.
  - Credit cards: -183,924 kr.
  - Savings: 9 kr.
  - Show Only Transactions
  - Taxi Eduardo Gai: Taxis & Public Transportation - 4,441 kr.
  - Schweiz. Bundes...: Planes, Trains and Automobile - 1,162 kr.
  - Tesco: -23,449 kr.
The financial aggregation app: screenshots
### Summary statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Statistics Iceland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly total income</td>
<td>3256.1</td>
<td>3530.5</td>
<td>4316</td>
</tr>
<tr>
<td>Monthly regular income</td>
<td>3038.2</td>
<td>3184.3</td>
<td>3227</td>
</tr>
<tr>
<td>Monthly salary</td>
<td>2703.5</td>
<td>2992.5</td>
<td>2456</td>
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<tr>
<td>Monthly irregular income</td>
<td>217.82</td>
<td>1414.8</td>
<td>1089</td>
</tr>
<tr>
<td>Monthly spending:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1315.1</td>
<td>1224.3</td>
<td></td>
</tr>
<tr>
<td>Groceries</td>
<td>468.29</td>
<td>389.29</td>
<td>490</td>
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<tr>
<td>Fuel</td>
<td>235.88</td>
<td>258.77</td>
<td>(359)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>61.75</td>
<td>121.43</td>
<td>85</td>
</tr>
<tr>
<td>Ready Made Food</td>
<td>170.19</td>
<td>172.64</td>
<td>(252)</td>
</tr>
<tr>
<td>Home Improvement</td>
<td>150.16</td>
<td>464.94</td>
<td>(229)</td>
</tr>
<tr>
<td>Transportations</td>
<td>58.33</td>
<td>700.06</td>
<td>66</td>
</tr>
<tr>
<td>Clothing and Accessories</td>
<td>86.62</td>
<td>181.27</td>
<td>96</td>
</tr>
<tr>
<td>Sports and Activities</td>
<td>44.29</td>
<td>148.41</td>
<td>(36)</td>
</tr>
<tr>
<td>Pharmacies</td>
<td>39.62</td>
<td>62.08</td>
<td>42</td>
</tr>
<tr>
<td>Age</td>
<td>40.6</td>
<td>11.5</td>
<td>37.2</td>
</tr>
<tr>
<td>Female</td>
<td>0.45</td>
<td>0.50</td>
<td>0.48</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.08</td>
<td>0.27</td>
<td>0.06</td>
</tr>
<tr>
<td>Parent</td>
<td>0.23</td>
<td>0.42</td>
<td>0.33</td>
</tr>
<tr>
<td>Pensioner</td>
<td>0.15</td>
<td>0.36</td>
<td>0.12</td>
</tr>
</tbody>
</table>

All numbers are in US dollars. Parentheses indicate that data categories do not match perfectly.
Looking at payday effects on spending

We run the following regression

\[ x_{it} = \sum_{k=-7}^{7} \beta_k I_i(Paid_{t-k}) + \text{fixed effects} + \epsilon_{it} \]
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- \( x_{it} \) ratio of spending of individual \( i \) to \( i \)'s average daily spending at date \( t \)
- \( l_i(Paid_{t-k}) \) payday indicator of individual \( i \) at date \( t - k \)
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- $\beta_k$ coefficients thus measure the fraction by which individual spending deviates from average daily spending
- individual fixed effects, day-of-week fixed effects, day-of-month fixed effects, year-month fixed effects, and holiday dummies
Looking at payday effects on spending

The effects of regular income arrival on spending for the bottom and top deciles of the salary distribution

- Individuals in the bottom decile spend 60% more than their average spending on paydays
- Individuals in the top decile spend 40% more than their average spending on paydays
Looking at payday effects on spending

The effects of regular income arrival on spending by ten deciles of the salary distribution
What is *not* going on

- Naturally coincident income and spending: we exclude recurring spending (rent, phone bills, ...) and look at irregular income too
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- Response to firm pricing: firms increase prices on common paydays but only marginally
- Endogenous income: we look at exogenous shocks (lottery winnings, tax rebates, wealth shocks from court-case payments)
- App usage: we do not observe a relation between payday responses and frequency of logging in
Looking at payday effects on spending

The effects of irregular income arrival on spending by ten deciles of the salary distribution
Are individuals spending on necessities?

The effects of income arrival on necessary spending by ten deciles of the salary distribution
Are individuals spending on necessities?

The effects of income arrival on unnecessary spending by ten deciles of the salary distribution
Gelman, Kariv, Shapiro, Silverman, and Tadelis (Science, 2014) payday responses

Fig. 2. Response of spending to income: Alternative components of spending. (A) Total spending. (B) Nonrecurring spending. (C) Fast food and coffee shop spending. The solid line represents regression coefficients from Eq. 1. The dashed lines are 95% confidence intervals. Estimates are based on 5,371,244, 5,371,244, and 5,173,594 total observations from 23,985, 23,985, and 23,021 users for panels (A), (B), and (C), respectively.

Fig. 3. Response of nonrecurring spending to income: Liquidity ratio. (A) Low liquidity. (B) Medium liquidity. (C) High liquidity. The solid line represents regression coefficients from Eq. 1. The dashed lines are 95% confidence intervals. Estimates are based on 1,784,460, 1,809,839, and 1,769,968 total observations from 7956, 7956, and 7955 users for panels (A), (B), and (C), respectively. The liquidity ratio is defined as the average daily balance of checking and savings accounts normalized by daily average spending.
The only day better than Friday is payday!

▶ Why is (some) people’s spending or consumption not independent of their income?
  ▶ Liquidity-constrained hand-to-mouth consumers (poor and rich)?
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- Why is (some) people’s spending or consumption not independent of their income?
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* What are liquidity constraints and how can we measure them?
  - Balance sheet liquidity: cash plus saving plus credit balance plus overdraft limit plus credit limit
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* What are liquidity UNconstraints and how can we measure them?
  - Spending prior to income payments?
  - Spending on unnecessary goods and services?
How many individuals are liquidity constrained on their paydays?

- Only 12% of individuals have less than ten days of spending left in cash on their paydays.
- Only 10% of individuals have less than ten days of spending left in liquidity on their paydays.

Cash holding (checking/saving balances)

Liquidity (credit/debit limits plus checking/saving balances)
How many individuals are liquidity constrained on their paydays?

- Less than 3% of individuals have less than one day of spending left in cash on their paydays.
- Less than 3% of individuals have less than one day of spending left in liquidity on their paydays.

Cash holding (checking/saving balances)  
Liquidity (credit/debit limits plus checking/saving balances)
Payday effects on spending by liquidity terciles

The effects of regular income on spending by liquidity (measured by the median number of consumption days held in cash)
Payday effects on spending by liquidity terciles

The effects of regular income on spending by liquidity (measured by the median number of consumption days held in cash or lines of credit)
Payday effects on spending by liquidity terciles

▶ What about liquidity UNconstraints?

The effects of regular income on spending by prior spending (how much people spend compared to average daily spending in the last 4 days prior to income arrival)
Payday effects on spending by liquidity terciles

What about liquidity UNconstraints?

The effects of regular income on spending by unnecessary spending (how much people spend on unnecessary consumption compared to average daily spending in the last 4 days prior to income arrival)
Summary statistics by liquidity terciles

Are people liquidity constrained by standard measures?

<table>
<thead>
<tr>
<th></th>
<th>Liquidity in 1st tercile</th>
<th>Liquidity in 2nd tercile</th>
<th>Liquidity in 3rd tercile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly total income</td>
<td>3119.34</td>
<td>4268.01</td>
<td>5158.81</td>
</tr>
<tr>
<td>Saving account balance</td>
<td>175.98</td>
<td>665.85</td>
<td>9655.23</td>
</tr>
<tr>
<td>Checking account balance</td>
<td>-1898.77</td>
<td>-1288.35</td>
<td>2850.07</td>
</tr>
<tr>
<td>Credit-card balance</td>
<td>-1137.87</td>
<td>-1866.11</td>
<td>-1911.71</td>
</tr>
<tr>
<td>Checking account limit</td>
<td>2677.27</td>
<td>3730.05</td>
<td>3784.48</td>
</tr>
<tr>
<td>Credit-card limit</td>
<td>2073.12</td>
<td>5385.96</td>
<td>8833.03</td>
</tr>
<tr>
<td>Cash</td>
<td>-1722.78</td>
<td>-622.51</td>
<td>12505.29</td>
</tr>
<tr>
<td>Liquidity</td>
<td>1889.75</td>
<td>6627.39</td>
<td>23211.08</td>
</tr>
<tr>
<td>Credit utilization</td>
<td>0.52</td>
<td>0.35</td>
<td>0.26</td>
</tr>
<tr>
<td>Checking account utilization</td>
<td>0.37</td>
<td>0.30</td>
<td>0.14</td>
</tr>
<tr>
<td>Number of days held in cash</td>
<td>-38.00</td>
<td>-14.00</td>
<td>214.00</td>
</tr>
<tr>
<td>Number of days held in liquidity</td>
<td>38.00</td>
<td>123.00</td>
<td>546.00</td>
</tr>
<tr>
<td>Age</td>
<td>36</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>Gender</td>
<td>0.53</td>
<td>0.46</td>
<td>0.39</td>
</tr>
</tbody>
</table>
Do households hold too much cash?

- Standard model: households hold life-time savings in cash and marginal propensities to consume out of transitory income shocks are small.

- State-of-the-art model for high marginal propensities to consume: Kaplan and Violante (Econometrica, 2014) with liquid and illiquid assets.

whereas in the data, we obtain
- 1st tercile holds 0.42
- 2nd tercile holds 1.37
- 3rd tercile holds 6.1

quarters of consumption in liquidity.
Intermediate conclusion

- Few people are liquidity constrained, but we may not measure liquidity constraints correctly: individuals may hold cash cushions for unforeseen events or “term save” for foreseeable expenses.
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- Impossible to measure? Let’s turn to a different literature/methodology:
Intermediate conclusion

- Few people are liquidity constrained, but we may not measure liquidity constraints correctly: individuals may hold cash cushions for unforeseen events or “term save” for foreseeable expenses.

- Impossible to measure? Let’s turn to a different literature/methodology:
  - the corporate finance literature dealt with this problem by looking not at spending (i.e., investment) responses but at cash holding responses (Almeida, Campello, and Weisbach (2004)).
  - potentially binding future liquidity constraints (insufficient cash cushions) can be measured by looking at individuals’ propensity to hold on to incoming cash.
The marginal propensity to hold on to cash

- Standard life-cycle model: the MPCash is always increasing in income/liquidity: \( \text{MPCash} = 1 - \text{MPConsumption} \)
- Model with liquid and illiquid assets: the MPCash may be increasing or decreasing: \( \text{MPCash} = 1 - \text{MPC} \text{IlliquidSaving} - \text{MPConsumption} \)
- Model with liquid and illiquid assets and binding future liquidity constraints: the MPCash is decreasing
Payday effects on cash holding by liquidity terciles

The effects of regular income on cash holding by liquidity (measured by the median number of consumption days held in cash or lines of credit)

- We find that cash holding are increasing in liquidity which is consistent with the standard model (without illiquid saving or future liquidity binding constraints)

Present and future liquidity constraints do not seem to play a role in explaining payday effects
Payday effects on cash holding by liquidity terciles

The effects of regular income on liquidity by liquidity (measured by the median number of consumption days held in cash or lines of credit)

- We find that cash holding is increasing in liquidity which is consistent with the standard model (without illiquid saving or future liquidity binding constraints)
- What about changes in overdraft limits?
The effects of regular income on overdraft limits by liquidity (measured by the median number of consumption days held in cash or lines of credit)

- We find that liquidity-constrained individuals reduce their overdraft limits in response to regular income payments
- We also look at checking, savings, and credit-card balances
Payday effects on cash holding by liquidity terciles

The effects of regular income on balances by liquidity (measured by the median number of consumption days held in cash or lines of credit)

- We find that balances are increasing in liquidity which is consistent with the standard model (without illiquid saving or future liquidity binding constraints)
Conclusion

- These clean and homogeneous responses point toward a shortcoming of existing models: intertemporal optimization.
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- How can we measure soft liquidity constraints?
Conclusion

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- It is important to understand the mechanism of fiscal stimulus responses (Kaplan and Violante (2014)).
- How can we measure soft liquidity constraints?
- How much of the payday response is driven by liquidity constraints as opposed to a license to spend?
Directions for future research

- Spending, saving, borrowing, and logging-in responses to exogenous wealth shocks (from a car-loan court case, lottery winnings, and CPI-indexed mortgages)
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- Understanding payday borrower’s spending and estimating whether spending causes payday borrowing (using weather as an instrument)
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- Looking at exogenous changes in intra-household bargaining power and their effect on household capital structure
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- Looking at exogenous changes in intra-household bargaining power and their effect on household capital structure
- Running surveys and experiments
The distribution of regular income over the month.
The distribution of irregular income over the month
Exogenous wealth shocks from a car-loan court case

- May 30th 2013: the Supreme Court of Iceland ruled vehicle loans with exchange rate indexation concluded in 2007 illegal
- After the announcement banks recalculated affected loans, and some customers received cash transfers starting in early July to January 2015

Fraction of transfers by month and amounts transferred
The estimated windfall elasticity

- Diff-in-diff regression with variable treatment intensities: common trends in expenditures of individuals in the control and treatment groups in the sixteen months before the court ruling

![Graph showing monthly consumption with trend lines]

Estimated first-month windfall elasticity is 20%

Results are not affected by including linear treatment-specific time trends in the regressions and we estimate placebo experiments
Payday effects on spending by exogenous liquidity

What about an exogenous liquidity inflow?

The effects of regular income on spending by exogenous liquidity


