Constrained Seasonal Adjustment for Correlated Series: How the Fed Seasonally Adjusts Liquid Deposits

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The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors.

Agenda

- Background
- Define the problem
- Explain *our* solution
- Effectiveness of the solution

Background

- The money supply is the total amount of money—cash, coins, and balances in bank accounts—in circulation.
- Two standard measures of the money supply include:
  - M1: the sum of currency held by the public and transaction deposits (i.e. "checking accounts") at banks
  - M2: M1 plus savings deposits, small time deposits, and retail money market mutual fund shares.
- Not seasonally adjusted (NSA) and seasonally adjusted (SA) measures of M1 and M2 are provided to the public as weekly and monthly averages on the H.6 Statistical Release.

H.6. Statistical Release

FEDERAL RESERVE statistical release

H.6 (508) MONEY STOCK MEASURES

For release at 4:30 p.m. Eastern Time
November 7, 2019

Table 1
Money Stock Measures
Billions of dollars

Date	Seasonally adjusted		Not seasonally adjusted	
	M1[1]	M2[2]	M1[1]	M2[2]
2017-Oct.	3,606.7	13,779.0	3,601.7	13,742.4
Nov.	3,630.6	13,809.5	3,603.6	13,811.6
Dec.	3,612.0	13,852.0	3,653.1	13,937.3
2018-Jan.	3,653.1	13,868.1	3,652.7	13,855.5
Feb.	3,622.5	13,890.6	3,566.5	13,841.4
Mar.	3,656.3	13,941.3	3,688.7	14,023.1
Apr.	3,660.2	13,976.5	3,698.5	14,066.9
May	3,654.6	14,038.3	3,655.9	13,987.6
June	3,655.1	14,107.8	3,654.6	14,079.5
July	3,676.9	14,148.8	3,678.0	14,114.1
Aug.	3,679.9	14,190.8	3,686.3	14,170.6
Sept.	3,703.7	14,225.3	3,671.0	14,205.0
Oct.	3,720.8	14,246.6	3,717.1	14,207.4
Nov.	3,700.1	14,264.7	3,674.9	14,261.0
Dec.	3,751.3	14,368.0	3,794.3	14,453.5

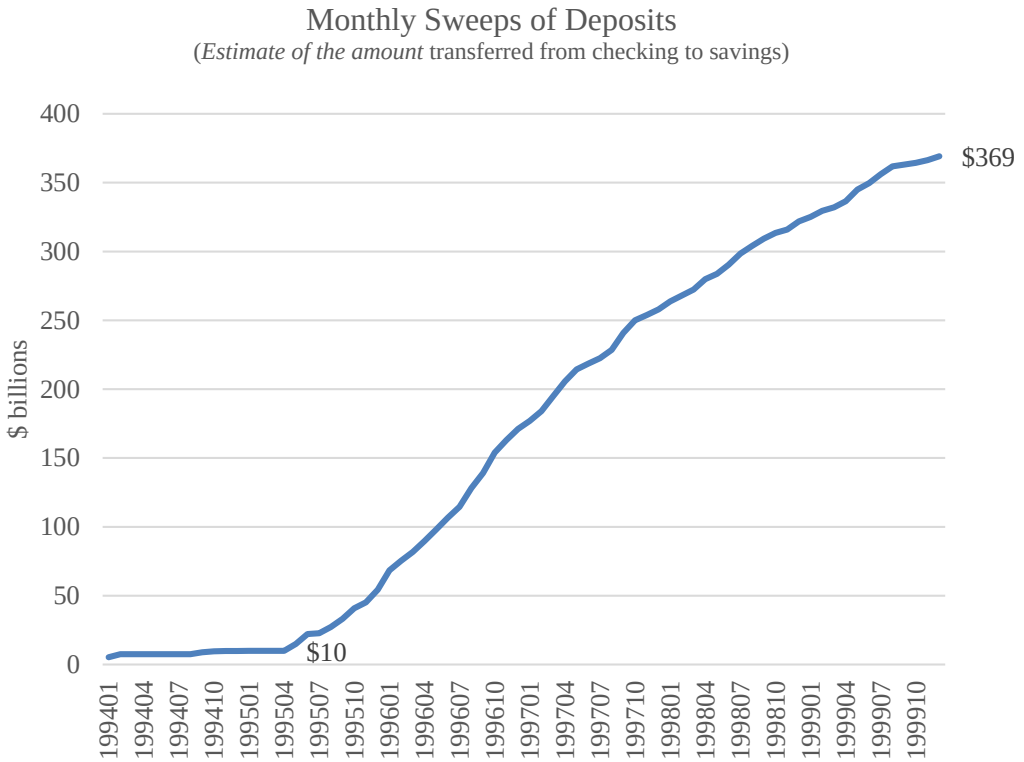
https://www.federalreserve.gov/releases/h6/current/default.htm

Background (Cont'd)

- Seasonal factors for weekly and monthly data series are generated once a year.
  - Monthly seasonal factors are created using X-13ARIMA-SEATS.
  - Weekly seasonal factors are derived using in-house time-varying least squares method.
- Staff have developed a methodology for ensuring weekly and monthly seasonal factors are consistent.

The Problem

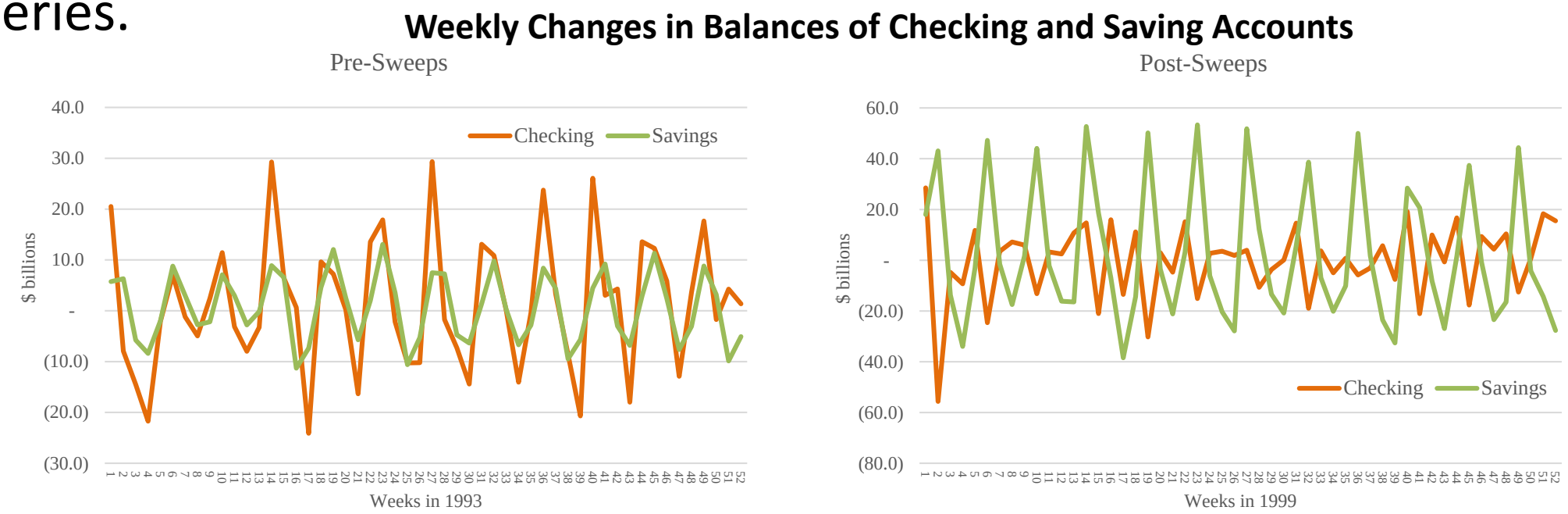
- In 1994, the Federal Reserve began allowing banks to transfer customer deposits from checking accounts to savings accounts to reduce reserve requirements.
- The use of these so called “retail sweeps” spread slowly initially.
- Starting in the second quarter of 1995, retail sweeps took off.



Source: Board of Governors (available on FRB St. Louis’ website)

The Problem (Cont'd)

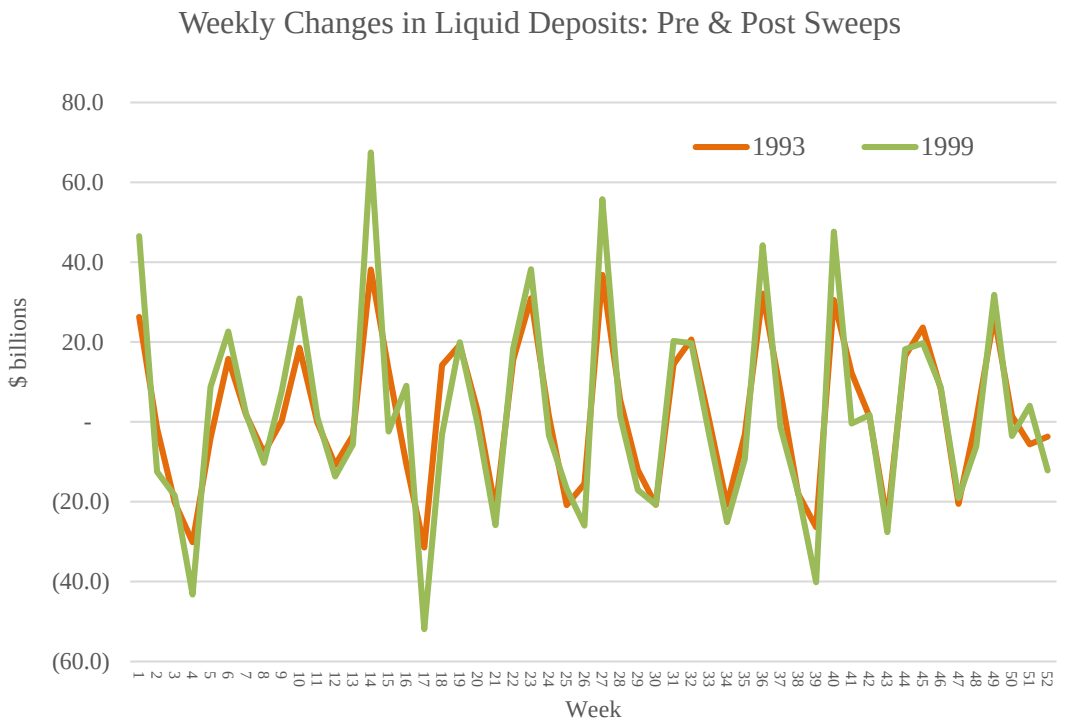
- As sweeping grew in size and number, they destabilized normal seasonal patterns related to checking account payment flows, and created new, negatively correlated seasonal patterns in the recipient savings deposit series.



Source: H.6 Statistical Release (available on the Board of Governors' website)
Note: Checking accounts represent the sum of Demand Deposits Adjusted and Other Checkable Deposits at all institutions on the H.6.

The Problem (Cont'd)

- The sum of data on checking and savings accounts, which we define as "liquid deposits," retained much more stable weekly patterns.



Source: H.6. Statistical Release (available on the Board of Governors' website)

The Problem (Cont'd)

- Seasonally adjusting liquid deposits yields more stable and reliable seasonable factors than seasonally adjusting each of its components.
- *However,* individual SA levels of the components are needed to support the construction of the monetary aggregates.
- Resulting problem:
  - $Liquid\ Deposits_{SA} \neq Checking_{SA} + Savings_{SA}$

Our Solution

- We've developed a method to constrain SA levels of Checking and Savings, individually, so that their sum is equal to the SA level of Liquid Deposits.
- The constraining process is run in **4** steps.

Our Solution (Cont'd)

- Step 1: Generate SA levels for **Liquid Deposits**, **Checking**, and **Savings** for period t.
- Step 2: Build the **SA constraint,** or $r_{SA,t}$, as $\frac{Liquid\ Deposits_{SA,t}}{Checking_{SA}+Savings_{SA,t}}$, using SA levels from step 1.
- Step 3: Derive the **constrained SA level** by multiplying $r_{SA,t}$ (step 2) by SA levels for **Checking** and **Savings** (step 3) individually.
  - E.g. $Constrained\ Checking_{SA,t} = r_{SA,t} \times Checking_{SA,t}$

Our Solution (Cont'd)

- Step 4: Derive the **constrained seasonal factor** for each component as the ratio of the historical NSA level to the constrained SA level (from step 3) for each component.
  - **E.g.** $\boldsymbol{Checking_{SF,t} = \frac{Checking_{NSA,t}}{Constrained\ Checking_{SA,t}}}$

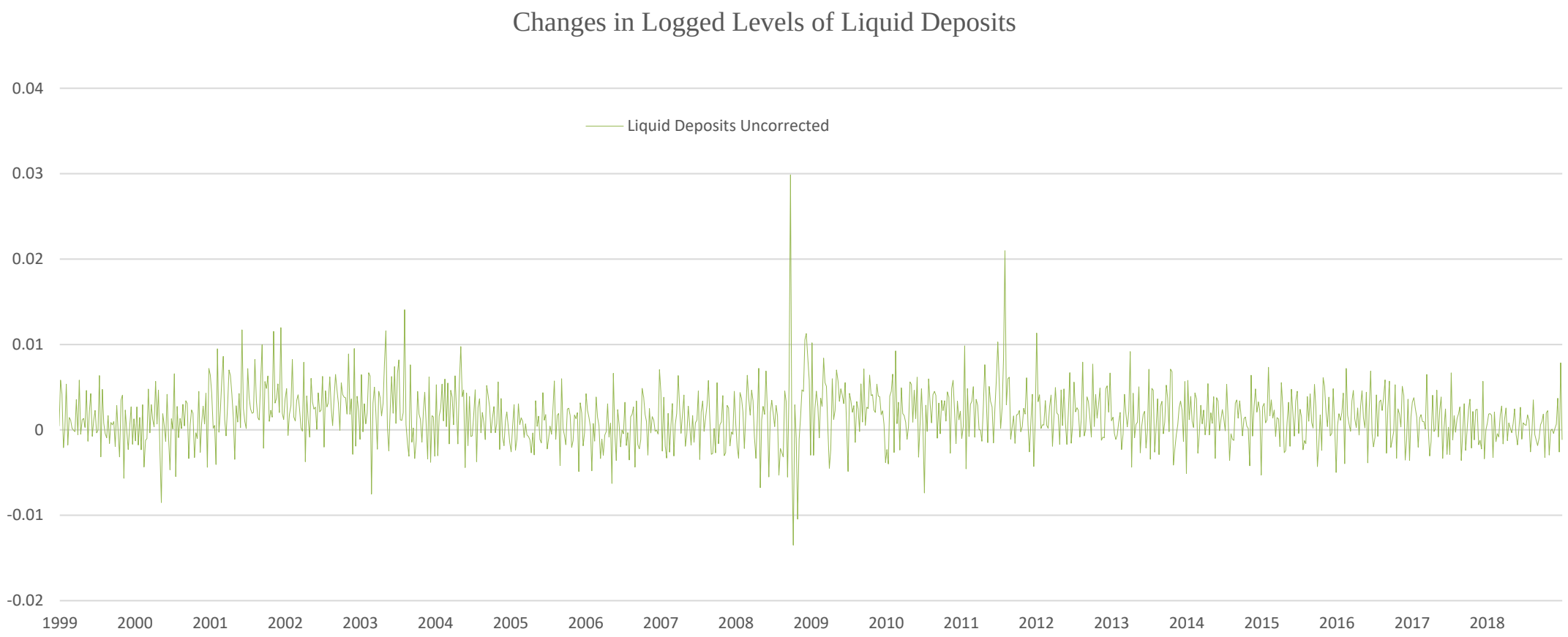
Effectiveness of the solution

- Technique improves overall smoothing of seasonal adjustment process.

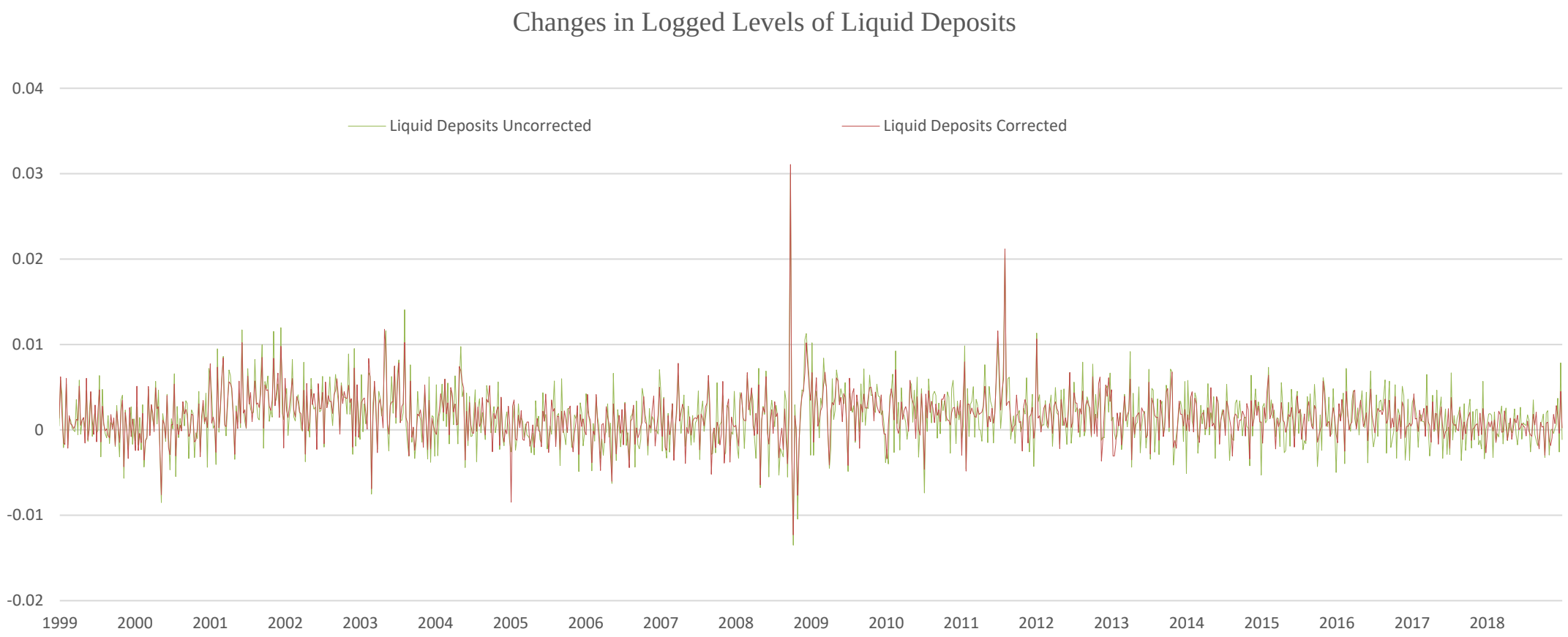
Standard Deviations of Changes in Logs			
	Original	Corrected	Improvement
Checking Deposits	0.01726	0.01684	2.4%
Savings Deposits	0.00426	0.00416	2.5%
Liquid Deposits	0.00334	0.00281	16.0%

- Improved smoothing extremely important for interpreting emergent trends in data.

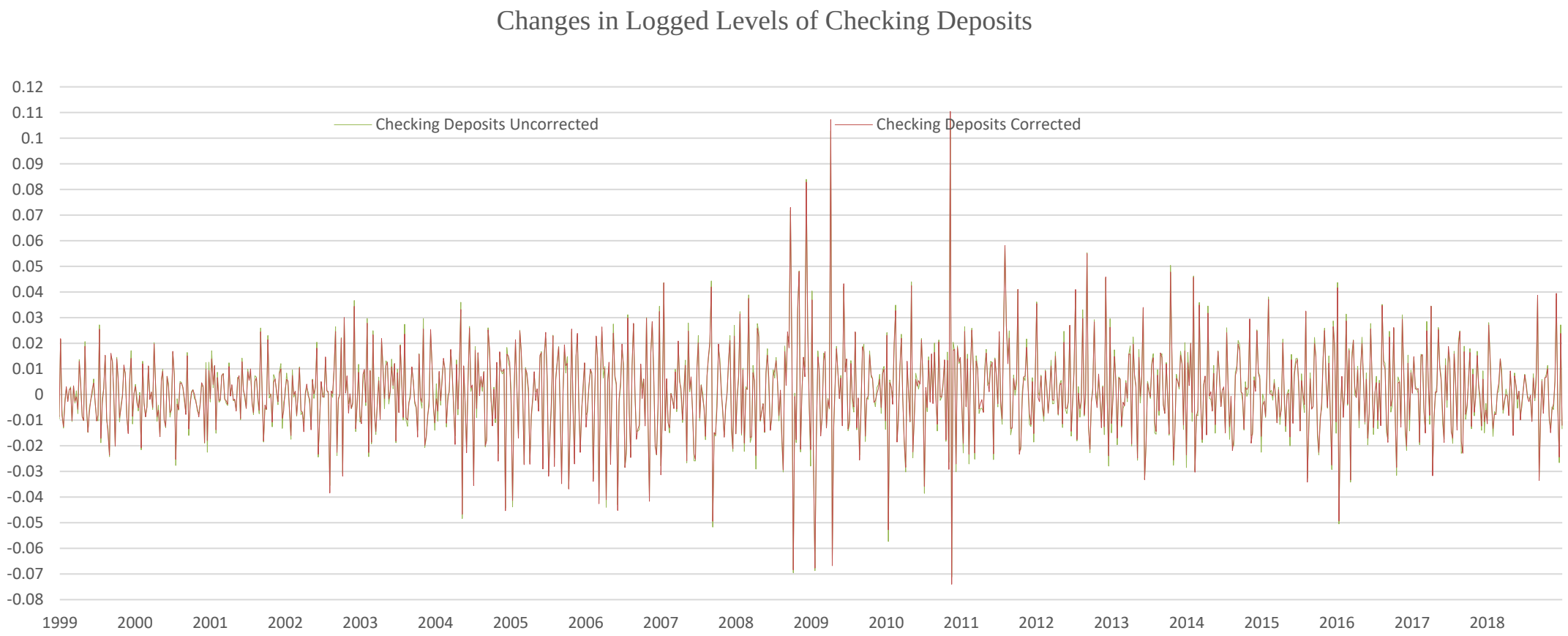
Effectiveness of the solution (Cont'd)



Effectiveness of the solution (Cont'd)



Effectiveness of the solution (Cont'd)



Questions

References

- H.6 Statistical Release, https://www.federalreserve.gov/releases/h6/
- Release of updated H.6 seasonal factors, https://www.federalreserve.gov/releases/h6/20190207/
- Retail Sweeps, https://research.stlouisfed.org/aggreg/swdata.html