

**Comment on the paper
E. Klee, 2007, “Operational problems
and aggregate uncertainty in the
federal funds market” (version:
29/05/2007)**

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ECB**

Frankfurt am Main, 12 November 2007

US Federal Funds Market

- **The US federal funds market is a very well functioning market. The Fedwire is a well-functioning payments system**
 - **In the January 1998 – June 2005 period the average deviation of the effective federal funds rate from the target on all days is less than 1 basis points**
- **However problems can occur. Instances of difficulty in the payments system are used to proxy for exogenous shocks to the federal funds market**

Objectives of the paper

- **Empirical paper that tries to answer the following questions:**
 - **Do operational difficulties have a measurable effect on the federal funds market?**
 - **What are the factors that determine the magnitude of the effect?**
 - **Do these effects persist?**

Structure of the paper

- **Institutional features of federal funds market and operational framework**
- **Brief survey of literature**
- **Sketch of theoretical model**
- **Empirical methodology**
- **Results**

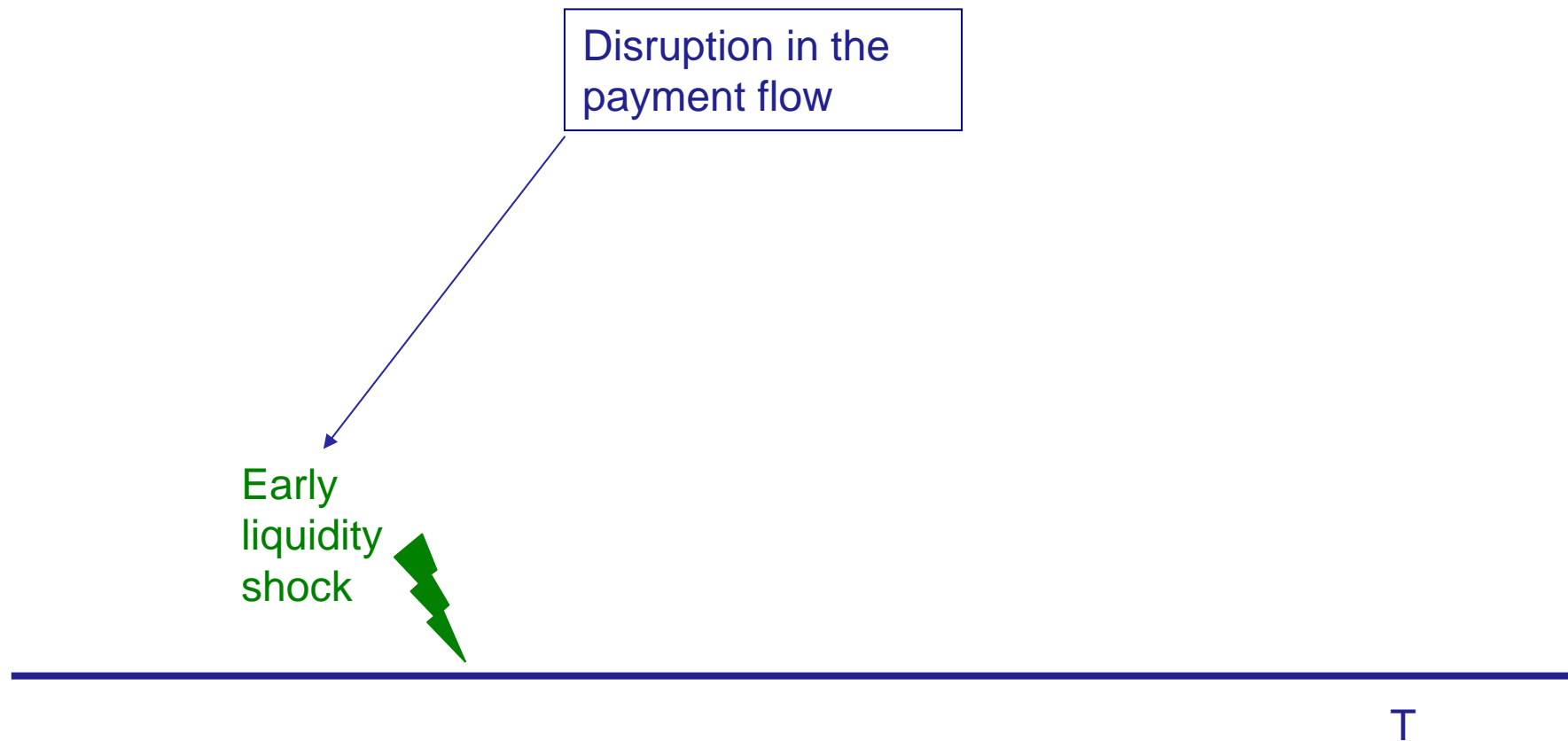
Theory

- **Liquidity risk not credit risk**
- **Operational risk => Liquidity risk**
- **Liquidity shock:**
 - **Unpredictable**
 - **Observable (extension to Fedwire)**

Theory

Klee focuses on identifying a liquidity shock

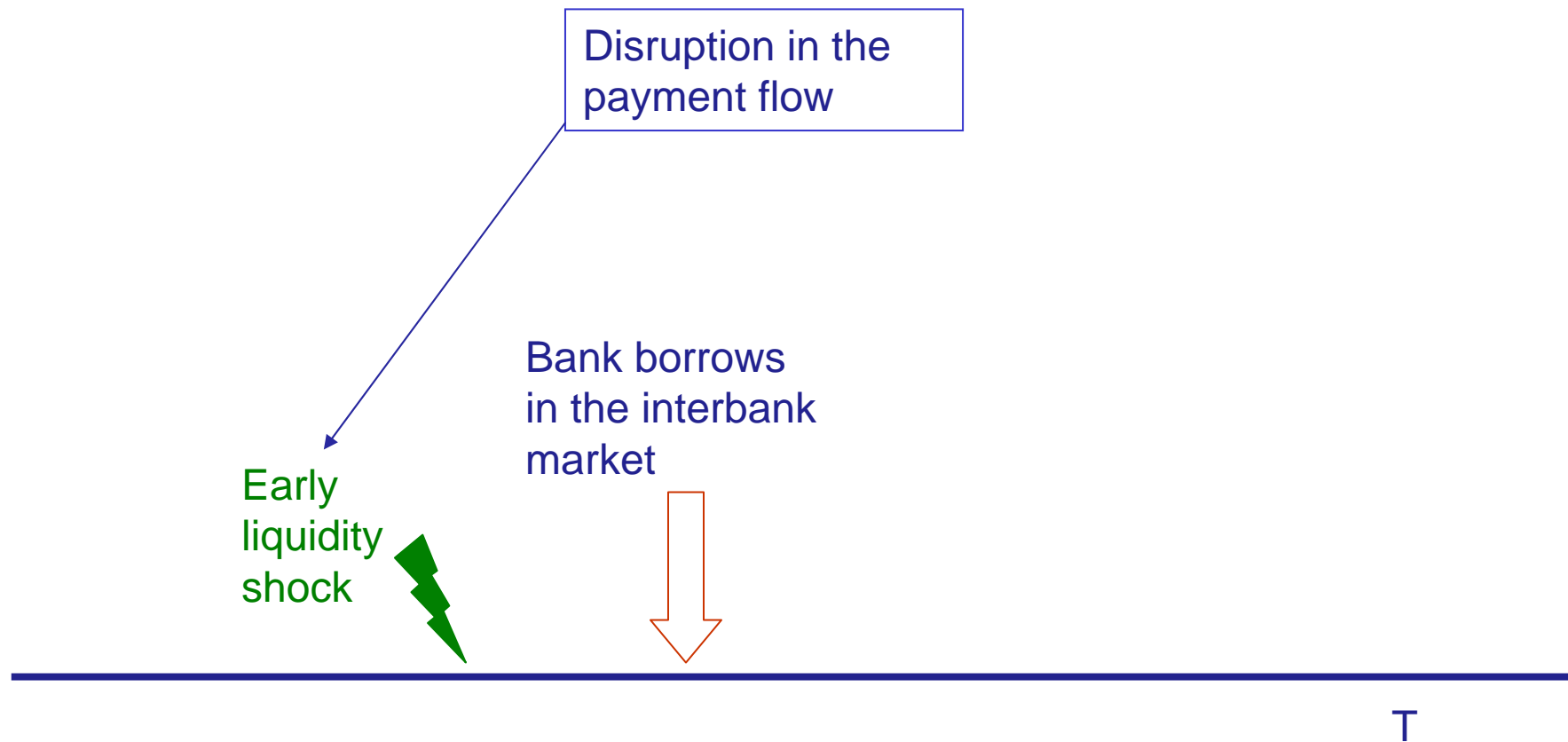
- One day in the reserve maintenance period:



Theory

Klee focuses on identifying a liquidity shock

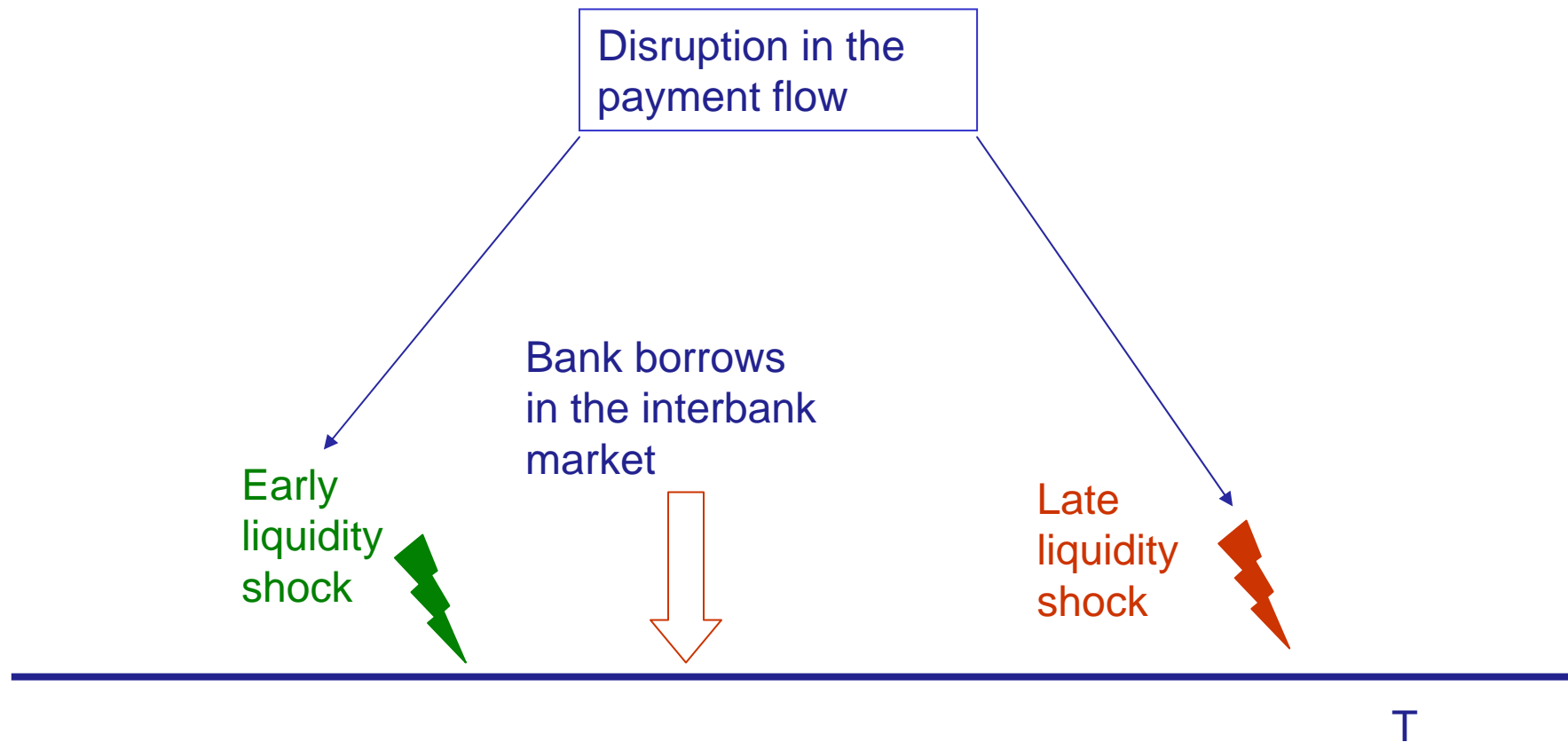
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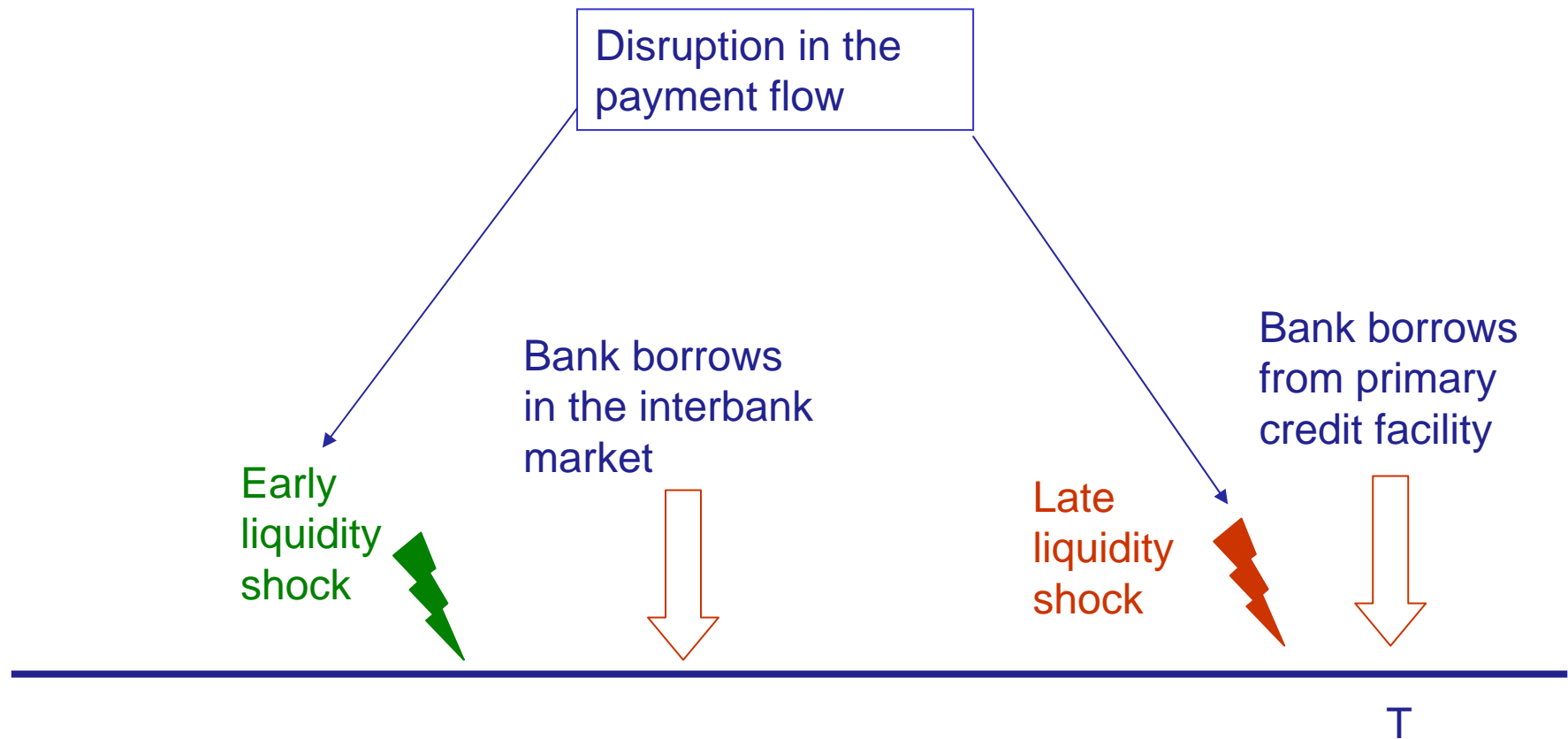
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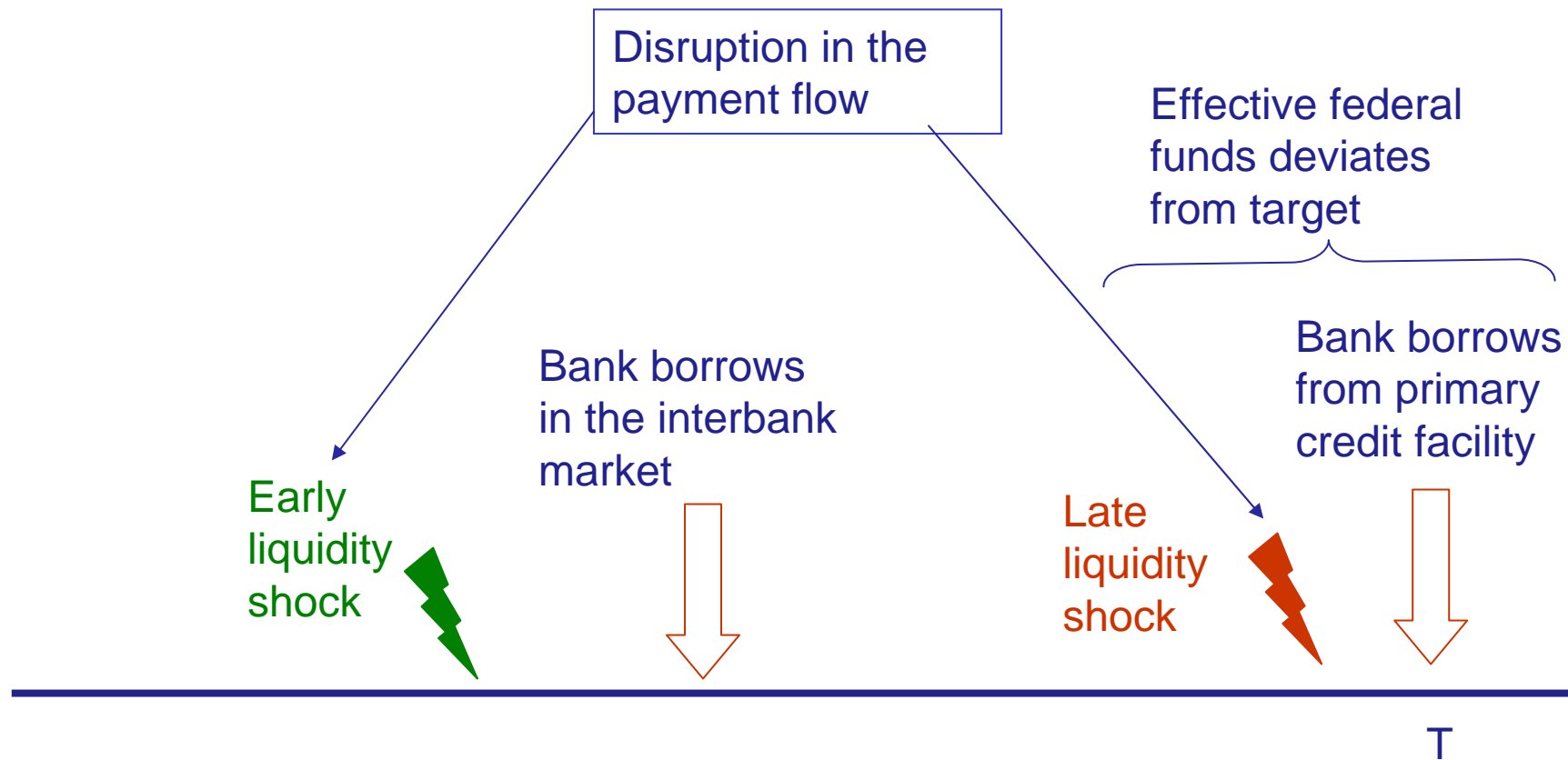
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Theory

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- One day in the reserve maintenance period:



Empirical methodology

- **Data from Fedwire funds transfer service**
- **50 accounts were examined**
- **Identifying outliers in payments patterns (outages) is a problem (non-standard distribution)**
 - **Monthly comparisons**
 - **Relative to the hour of the day**
 - **And the institution at which it occurred**

Empirical methodology

Regression analysis:

- **LHS:**

- Deviation of effective federal funds rate from target (ff-tar)
(Models 1, 2 and 4)
- Probability of an extension of Fedwire (P[ext=1])
(Model 3)
- Intraday st. dev. of effective federal funds rate (ffstddev)
(Model 5)
- Primary credit borrowed overnight (discount window borrowing) (credit)
(Model 6)

Empirical methodology

Regression analysis:

- **RHS:**

- Lagged (ff-tar) (1 lag)
- Vector of outages characteristics (OUT) (contemporaneous and 1 lag)
 - Dummy for an outage
 - Dummy for an outage at an account ranked in the top 25 by the number of sent payments from January to June 2005
 - Dummy if outage > 30 min.
 - Dummy if 4 pm < outage < 6 pm
- Vector of calendar effects (C)
 - Dummy for 1st, 15th or last day of the month
 - Dummy for end of quarter

Empirical methodology

Regression analysis:

- **Model 1: $ff\text{-tar} = F(1 \text{ lag } ff\text{-tar}; \text{OUT}; \text{ext}; \text{C}) + \text{error1}$**

Empirical methodology

Regression analysis:

- Model 1: $\text{ff-tar} = F(1 \text{ lag ff-tar; OUT; ext; C}) + \text{error1}$
- **Model 2: $\text{ff-tar} = F(.) + G(1 \text{ lag OUT, ext, C}) + \text{error2}$**

Empirical methodology

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- **Model 3: $P[\text{ext}=1] = H(\text{OUT; C}) + \text{error3}$**

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- **Model 4:**
$$\left\{ \begin{array}{l} \text{ff-tar} = f1(1 \text{ lag ff-tar; ext; C}) + \text{error11} \\ \text{ext} = f2(\text{OUT; C}) + \text{error21} \end{array} \right.$$

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- **Model 5: $\text{ffstddev} = M(1 \text{ lag ffstddev; OUT; ext; C}) + \text{error5}$**

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- **Model 6: $\text{credit} = Z(\text{OUT}; \text{ext}; \text{C}) + \text{error6}$**

Main empirical findings of the paper

- **The deviation of the effective rate from the target rate is positive on days with possible operational problems**
- **The magnitude of the effect depends on:**
 - **Severity of the difficulty**
 - **The volume of payments made by the affected participant**
 - **The time of day at which it occurs**
- **Discount window borrowing picks up on days with operational difficulties**
- **The impact on the fed funds is transitory**

Comments: on empirical methodology

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➤ **Seasonal effects very difficult to capture with C dummies**

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 - **Model 5:** $\text{ffstddev} = M(1 \text{ lag ffstddev; OUT; ext; C}) + \text{error5}$
- **Model 5 suggests that error1, 2 and 11 are of the GARCH type (error variance is time-varying)**

Comments: on empirical methodology

- In the model sketched by Klee outages explain Fedwire extensions and primary credit borrowing:
 - they occur at the **end of the day** when the interbank market is less liquid or when bilateral dealings would expose the borrower (weak bargaining position)
 - or they occur at the **end of the reserve maintenance period** when the supply of funds in the interbank market is less elastic because the averaging mechanism is no longer available
- However it is unclear **why** and **how** outages (late in the day) should affect the **effective federal funds rate** (average over the day)

Comments: on empirical methodology

- The **last day of the reserve maintenance period effect** and more generally the **within maintenance period effects** may play a role as the supply of funds in the interbank market is time-varying
- This could be modelled by **multiplicative dummies**
 - $\text{ext} * C$
 - $\text{OUT} * C$
 - $(\text{lag ff-tar}) * C$
- The null hypothesis could then be that **ext** and **OUT** affect funds rate only on the **last day of the reserve maintenance period**

Comments: on theory

- **Academic literature on commercial bank's reserve management in a stochastic environment started almost 40 years ago with W. Poole, JF 1968**
- **Recent papers building on Poole's framework: Quirós and Mendizábal, JMCB 2006; Gaspar, Quirós and Mendizábal, EER 2007; Whitesell, JME 2006, among others**

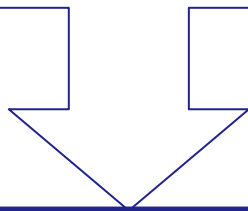
Comments: on theory

- **Common assumption: liquidity shock creates uncertainty in the liquidity management of commercial banks**
- **One day in the reserve maintenance period:**

At the start of the day:

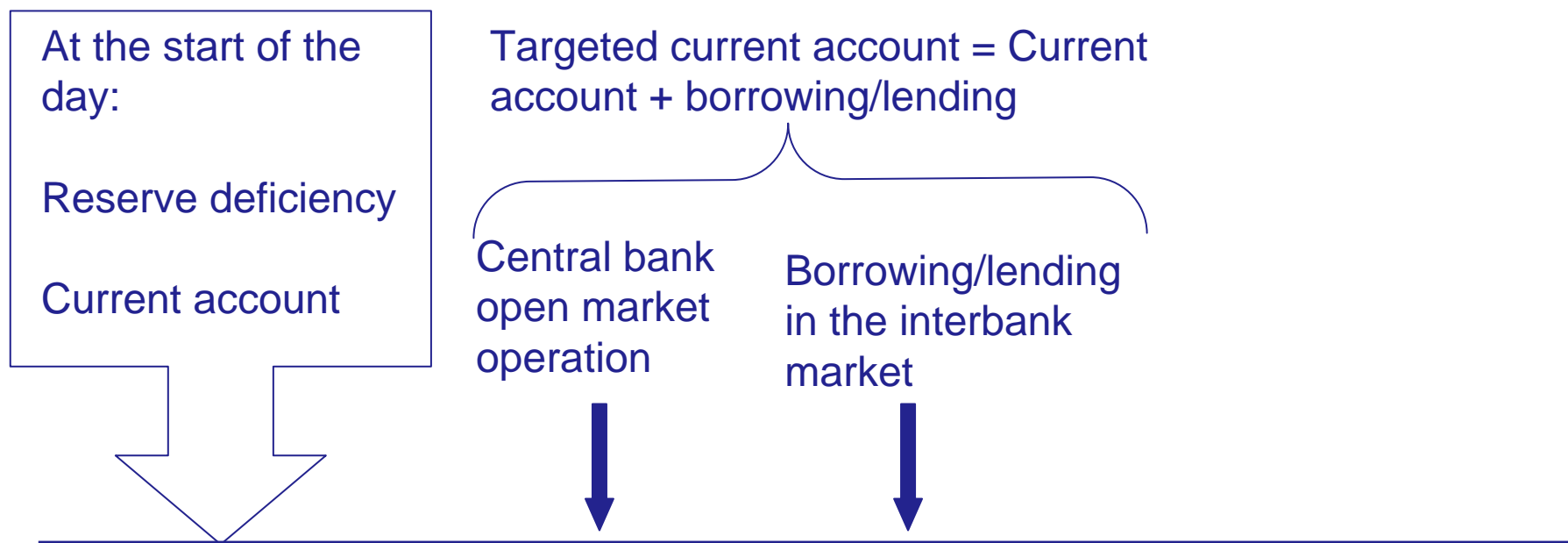
Reserve deficiency

Current account



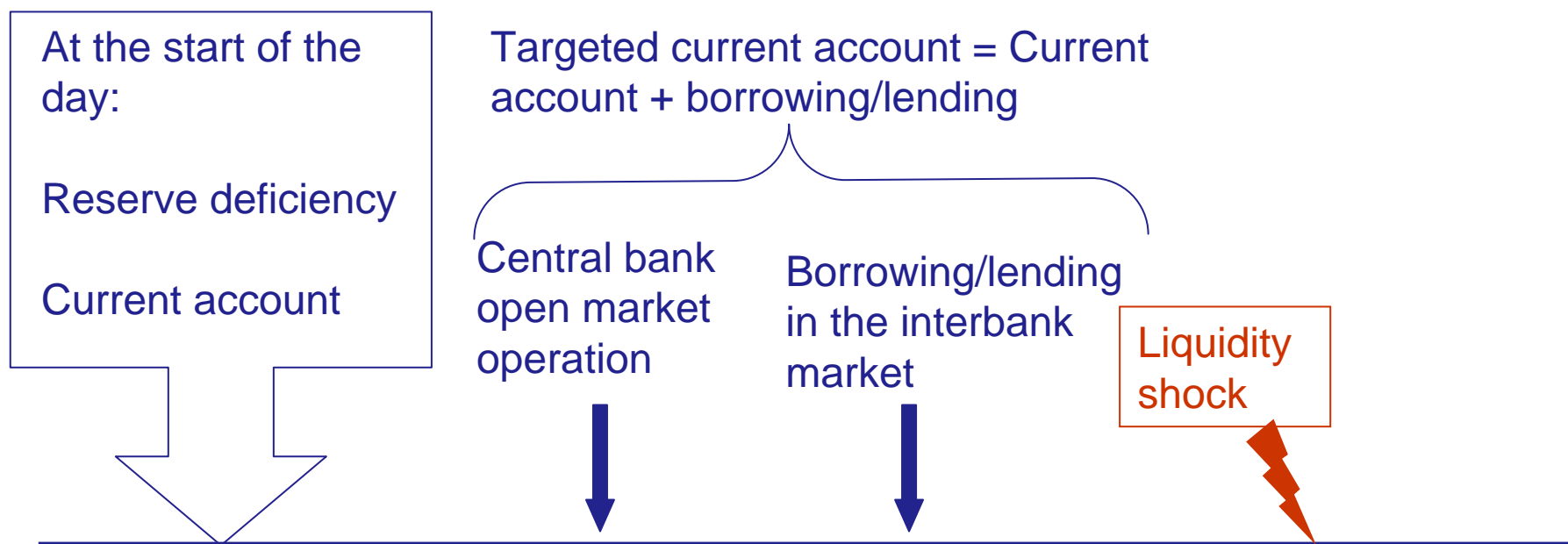
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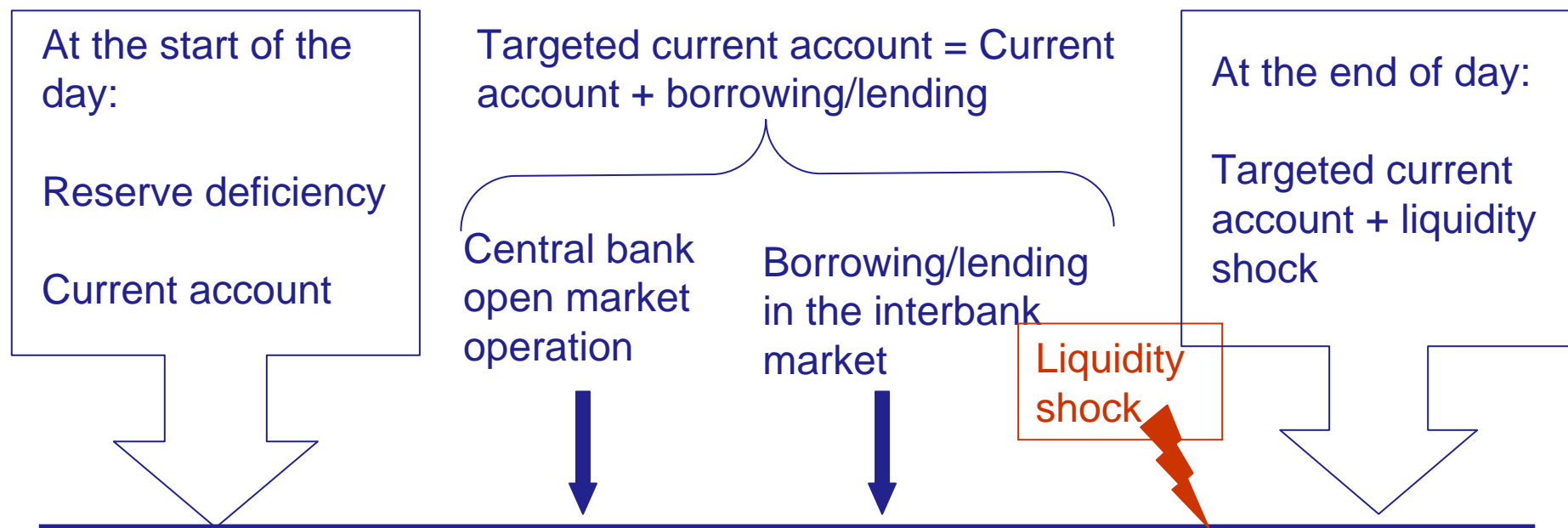
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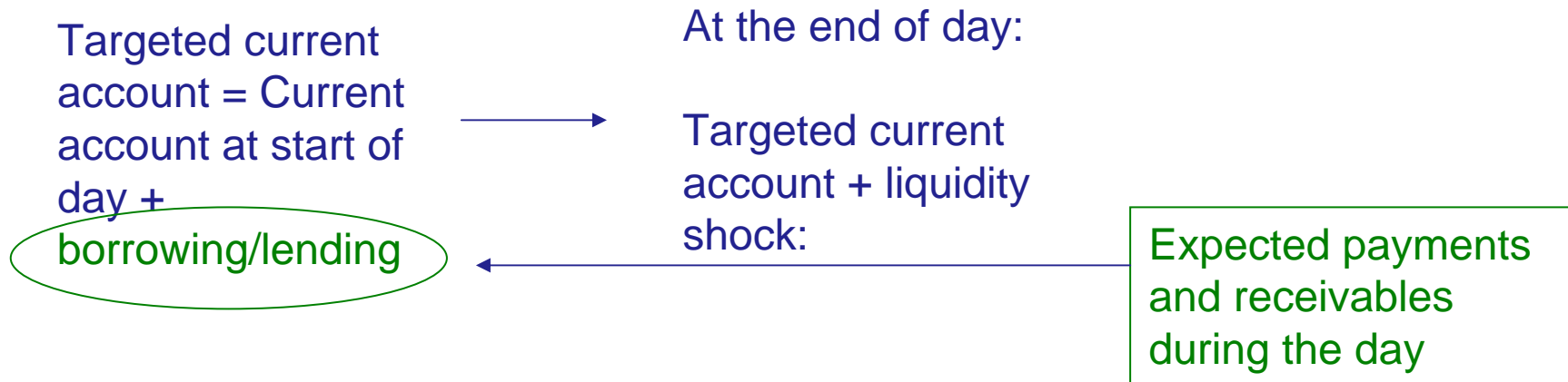


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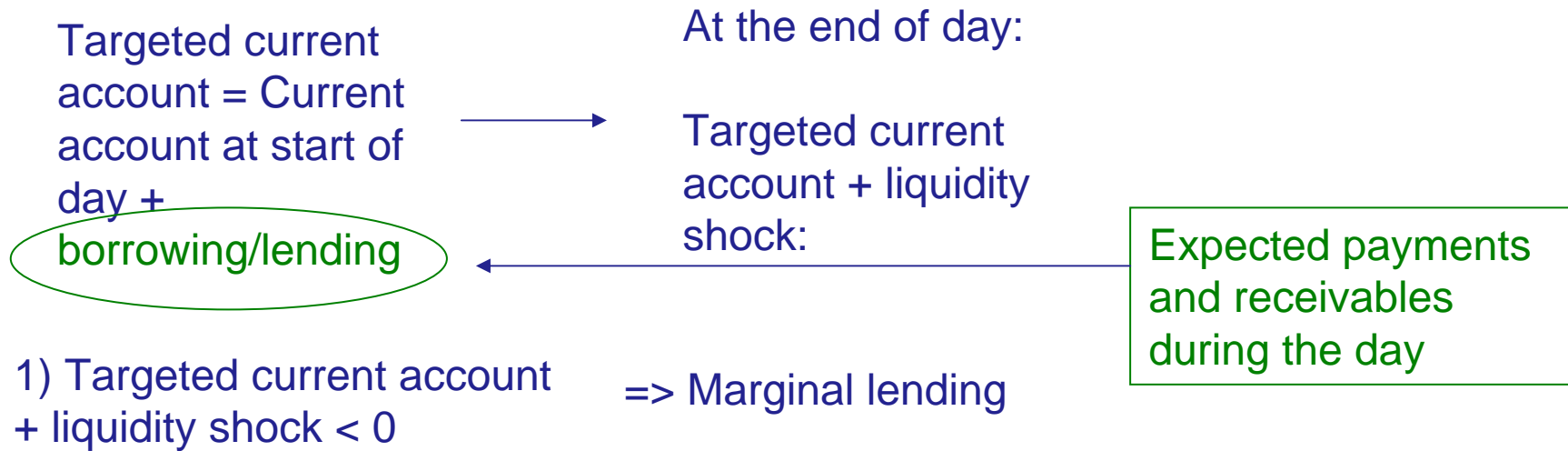
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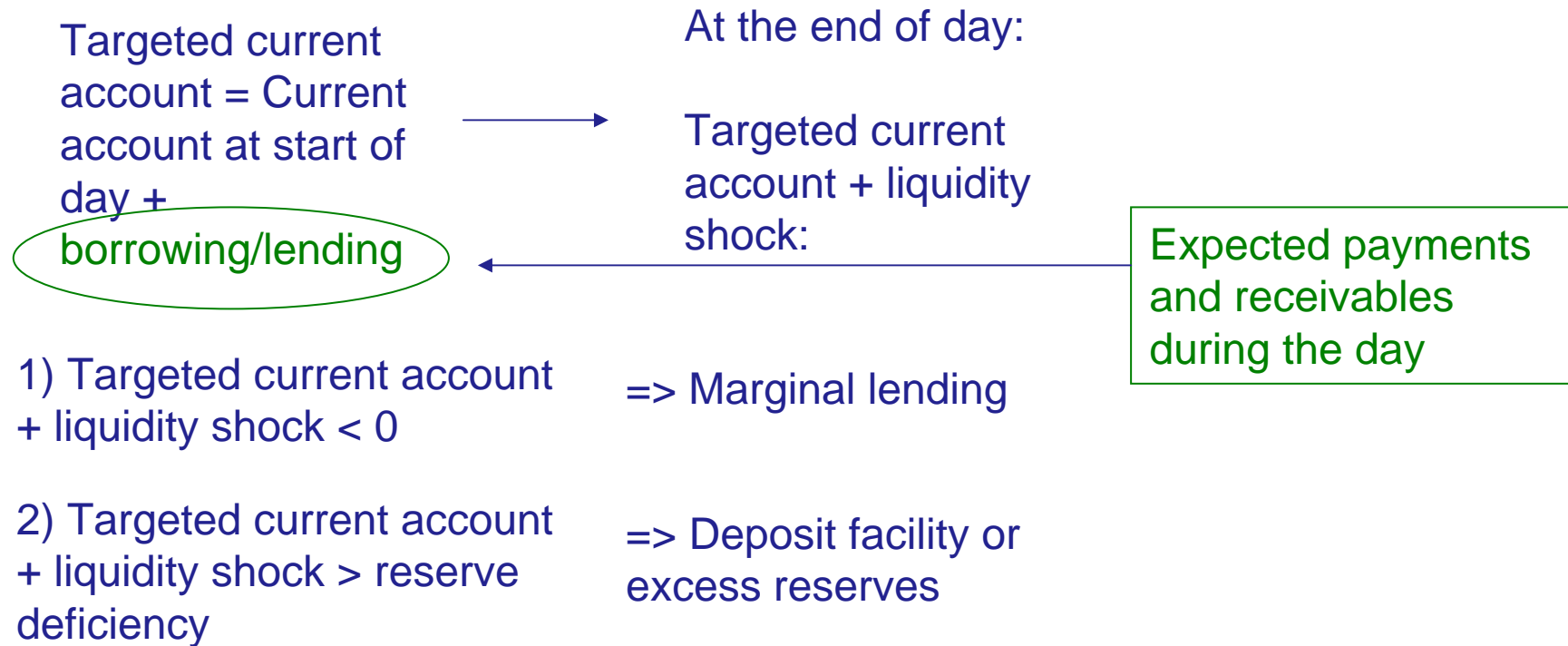
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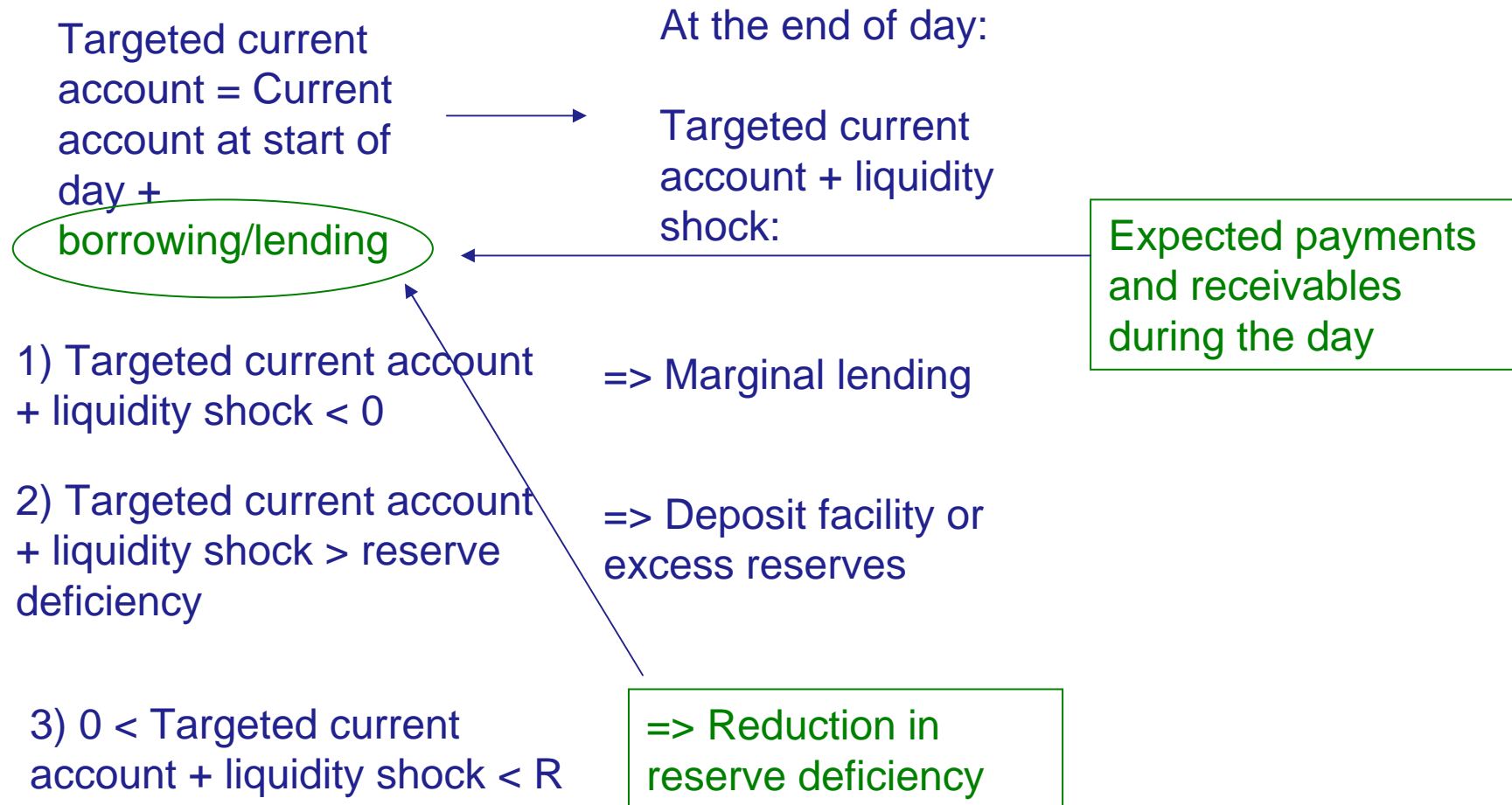
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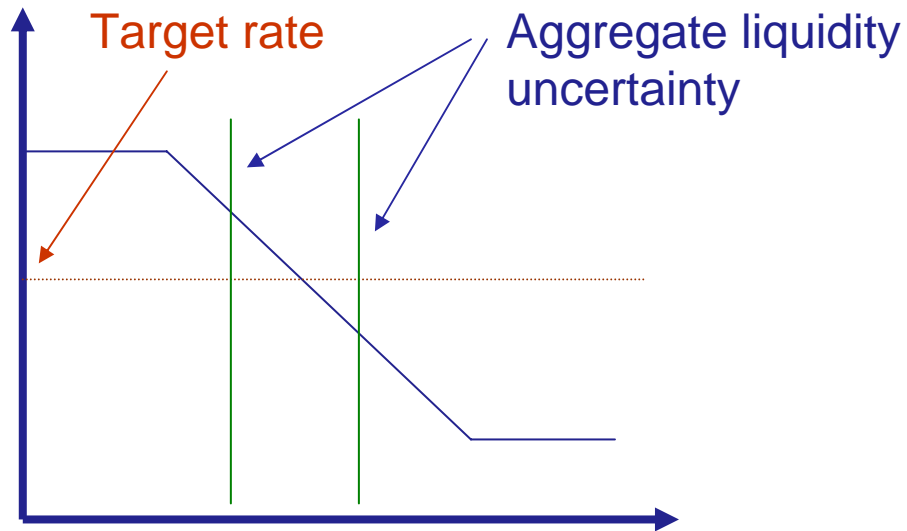
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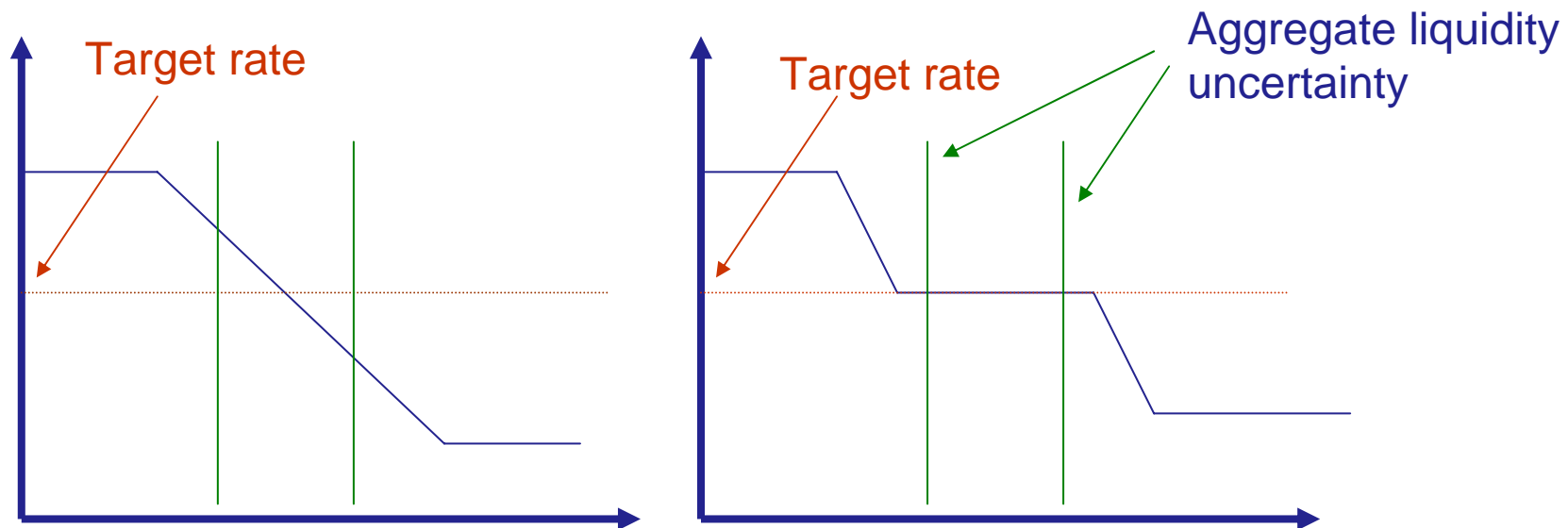
Comments: on theory



Bank's demand function
without averaging (or low
reserve requirement)

Higher volatility of overnight interest rate

Comments: on theory



Bank's demand function without averaging (or low reserve requirement)

Bank's demand function with averaging (or high reserve requirement)

Higher volatility of overnight interest rate

Comments: open questions

- **Optimal size of reserve requirement: voluntary or compulsory?**
- **Remuneration of reserve requirement?**
- **Averaging mechanism?**
- **Length of maintenance period?**
- **Automatic recourse to standing facilities?**
- **Last day of maintenance period issue: how to flatten the demand curve?**
- **Collateral for daylight/overnight lending?**
- **Synchronize payment flows and interbank trading?**