Deposit Withdrawals

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Since the global financial crisis, large aggregate deposit outflow events

- Deposit loss episodes in Europe:
  - **Ireland**: >10% drop in 2011, **Portugal**: > 10% drop in 2011, **Greece**: >20% drop in 2012 and >20% in 2015, **Cyprus**: >30% drop in 2013
- Similar deposit withdrawal episodes **all over the world** since 2010 alone:
  - Iceland, Argentina, Ecuador, Venezuela, Dominican Republic... Plots
- We have also seen large deposit outflows in response to the Covid crisis.

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2. **Heterogeneity:** not all depositors behave in the same way
   - Beliefs about fundamentals? About other depositors' behavior?
3. **Changes in Rates:** Banks increased rates on some deposits (Martin, Puri and Ufier 2018)
   - Scope for stabilization? How? At what cost?

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Strategic Motives:

expectation other depositors will withdraw (e.g., bank illiquid)

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- Uncertainty is hard to measure
- Identification challenges:
  - → Macro shocks affect idiosyncratic motives (e.g., higher probability of being unemployed)
  - → Fundamental news affect strategic motives (e.g., Goldstein and Pauzner 2005, Morris and Shin 2004)
    - Are depositors reacting to the news or to other depositors' reaction to the news?

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- We develop a new approach to measure the extent to which deposit withdrawals are due to idiosyncratic, fundamental, or strategic motives
  - In both quiet and high-uncertainty periods
- Using new approach on daily deposit-level data on time deposits for a large Greek bank, we quantify:
  - Magnitude and heterogeneity for deposit withdrawals across different motives
  - Depositor compensation (to *not* withdraw) after a deterioration in fundamentals

Preview of Results: Separating and Quantifying Withdrawal Motives

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1. Time-deposit withdrawals for idiosyncratic motives are frequent (even in times of low uncertainty)
   - → 10% of time-deposits are withdrawn before maturity each year
   - → Early withdrawals lose all accrued interests at average forgone annualized return of 17%
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3. Following aggregate uncertainty shock that increase CDS by 136%, additional withdrawals increased 4 times.
   - → Decompose into withdrawals driven by fundamental (2/3) and strategic motives (1/3)
4. Preventing withdrawals in a 3-week window requires offering depositors a payment of:
   - → 0.8% - 1.6% of value of their deposits depending on their motives

Where Does the Paper Fit in the Literature?

- **Theoretical Work on Deposit Runs and Financial Contagion**
  - Strategic Complementarities: Diamond and Dybvig (1983), Goldstein and Pauzner (2005) ...
  - Dynamic dimension: He and Xiong (2012), He and Manela (2016), Ahnert and Kakhbod (2017), Schliephake and Shapiro (2018)...
- **Recent Empirical Work on Depositor Behavior**
  - Drechsler et al. (2018): Deposits are "sticky," U.S. aggregate data
  - Egan et al. (2017): "Run-prone" uninsured deposits cause fragility, U.S. aggregate data
  - Iyer and Puri (2012), Iyer, Puri and Ryan (2018): micro-data evidence on bank runs, Indian cooperative bank, bank-specific events
- Important work, but provides limited insight on policies to provide stability in the wake of uncertainty

Outline for Today

1. ~~Motivating Framework~~
2. Data and Key Events
3. Empirical Strategy: Separating and Quantifying Depositor Withdrawals
   - Fundamental Motives
   - ~~Strategic Motives~~
   - ~~Idiosyncratic Motives~~
4. Results ~~and Heterogeneity Analysis~~
5. Quantification of Depositor Compensation

FRAMEWORK

Key Ingredients

- A bank has time deposit contracts with a continuum of small depositors.
- Contract periods are staggered.
- Every period t before maturity T, each time depositor chooses whether to withdraw her time deposit or wait until maturity.

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- Contract periods are staggered.
- Every period t before maturity T, each time depositor chooses whether to withdraw her time deposit or wait until maturity.
- A depositor withdrawal decision depends on:
  - $\rightarrow$ **The payoff of withdrawing early**
  - $\rightarrow$ **The expected value of the time deposit at maturity**

Payoff from Early Withdrawal

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- ϵ_{it} **is a depositor-specific, unobservable (to the econometrician) idiosyncratic shock.**

  $\rightarrow$ It can be interpreted as a liquidity shock.

  $\rightarrow$ Captures idiosyncratic motives for early withdrawal.

Expected Value of Time Deposit at Maturity (I)

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- R_T **is the interest rate for time deposits with maturity** T**.**
- θ_t^T **captures fundamentals.**
  - → Includes all factors affecting the fundamental value of the time deposit at maturity T.
  - → These factors include all aspects that impact bank's solvency, such as currency risk, re-denomination risk, and capital controls.
  - → Fundamentals deteriorating imply a higher probability of depositors getting a haircut on the value of their time deposits.

Expected Value of Time Deposit at Maturity (II)

$V_t^T(R_T, \theta_t^T, \gamma_t)$ is the expected value at time t of a time deposit with maturity T.

- $\gamma_t(\theta_t)$ **captures strategic complementarities**
  - $\rightarrow$ Effect from other depositors' withdrawal behavior at time t.
  - $\rightarrow$ If a sufficiently large number of depositors withdraw at t ($< T$), the bank may become illiquid.
  - $\rightarrow$ Remaining depositors would get a haircut on the value of their time deposits.
  - $\rightarrow$ It is a function of fundamentals for all maturities $T > t$ (e.g., Goldstein and Pauzner 2005).

Example with Two (Almost) Identical Time Deposits

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- Time Deposit A:
  - → **Principal:** €10K. **Interest Rate:** 2%. **Maturity:** 6-months.
  - → Originated in **June** (t_0^A)
  - → Matures in **December** (T^A)
- Time Deposit B:
  - → **Principal:** €10K. **Interest Rate:** 2%. **Maturity:** 6-months.
  - → Originated in **August** (t_0^B)
  - → Matures in **February** (T^B)

Quiet Times

Good Fundamentals (Negligible Strategic Complementarities)

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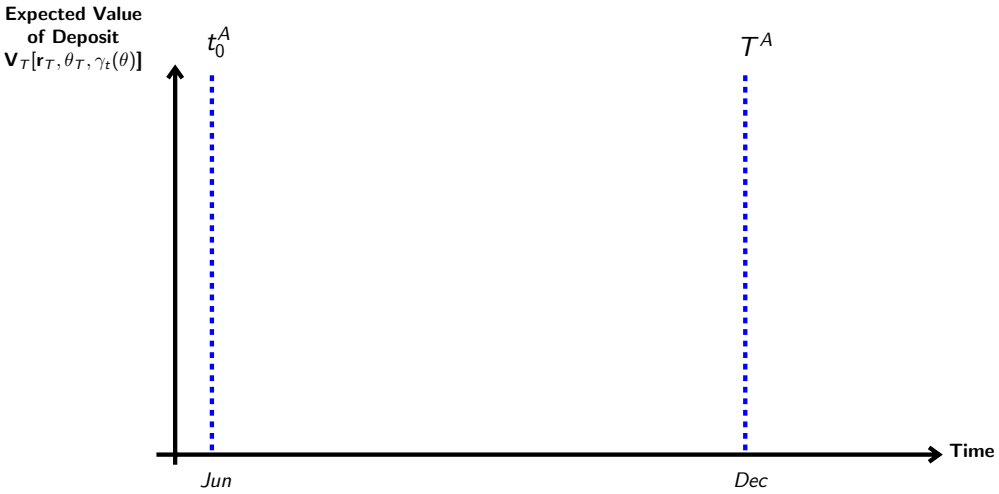

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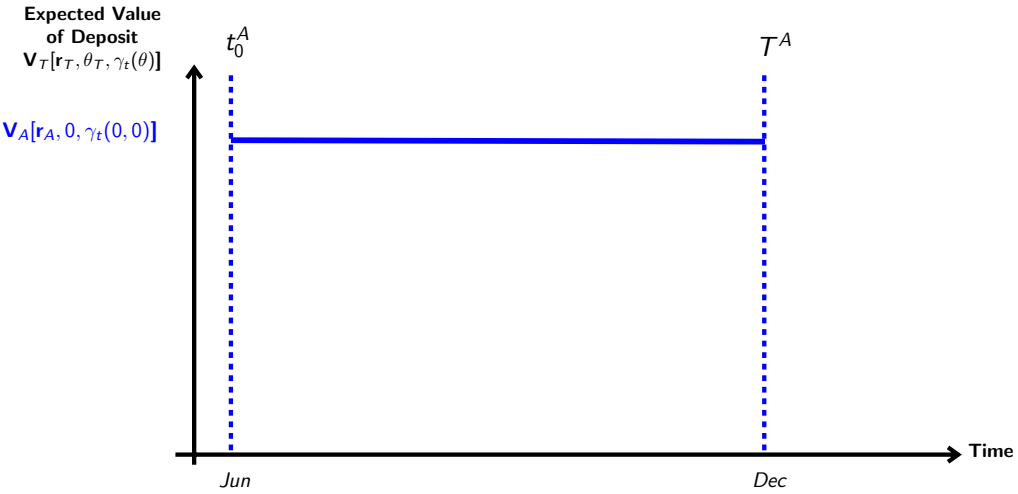

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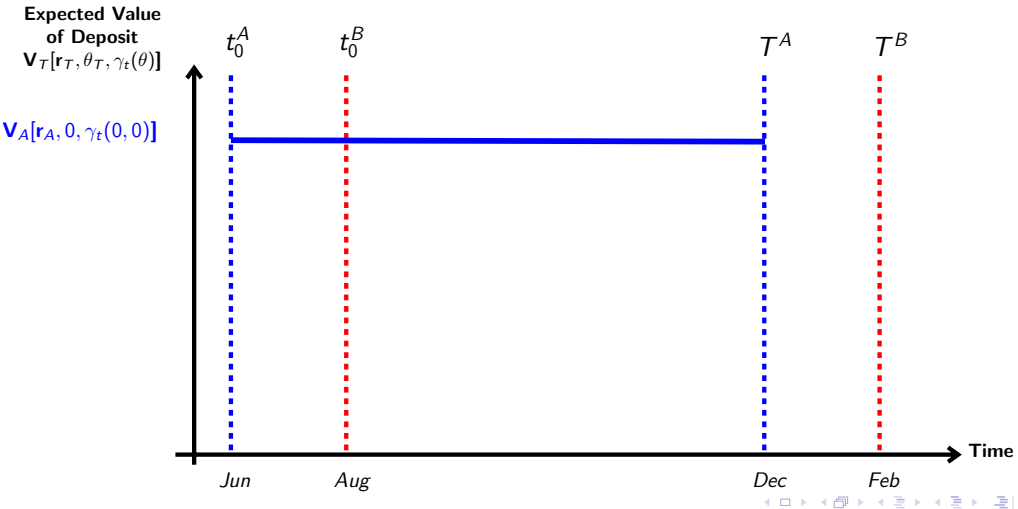

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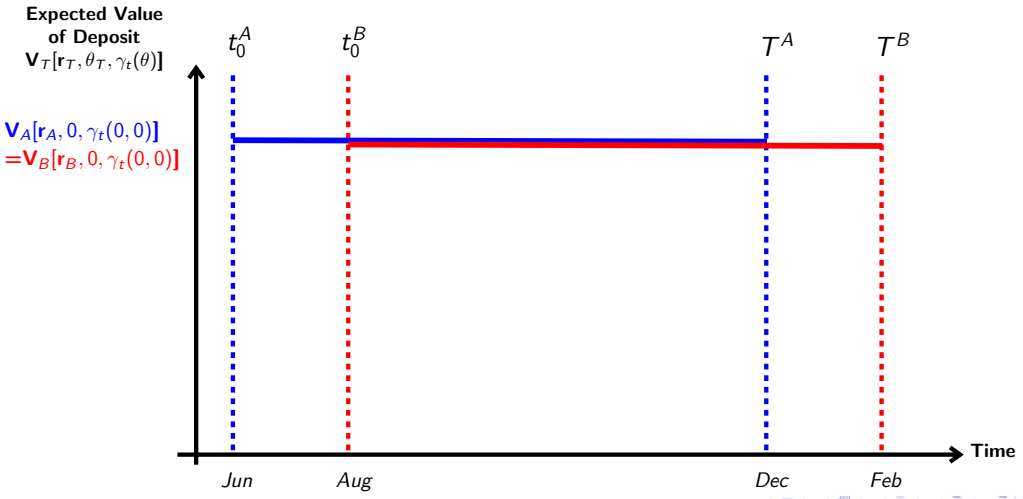
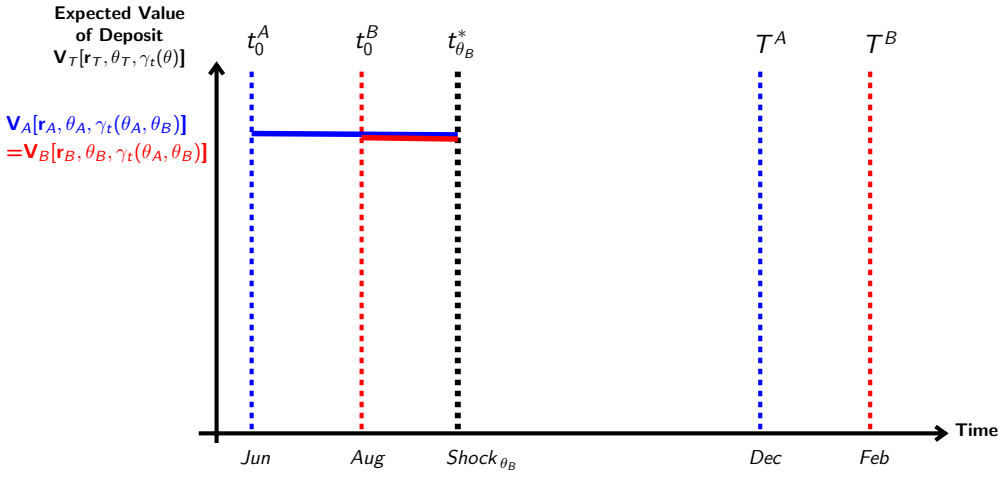


Direct and Indirect Effects in Expected Values



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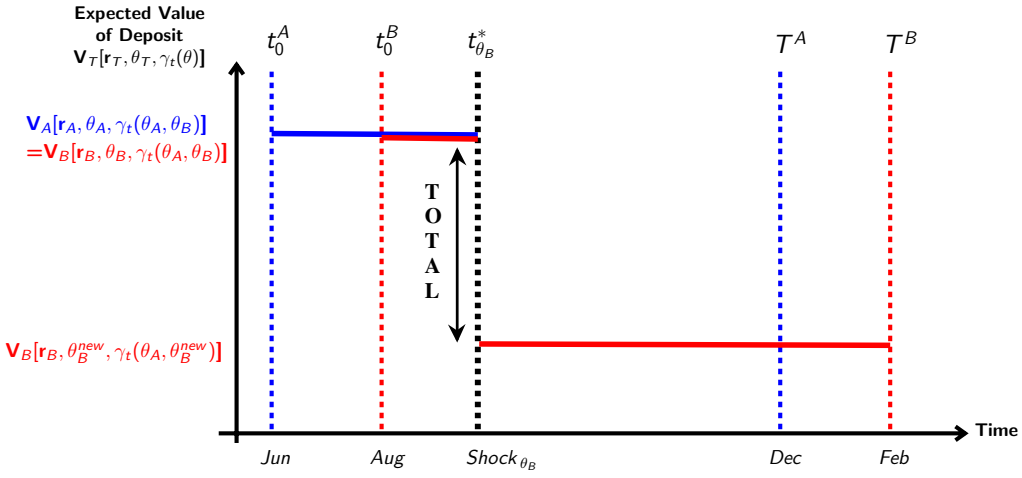

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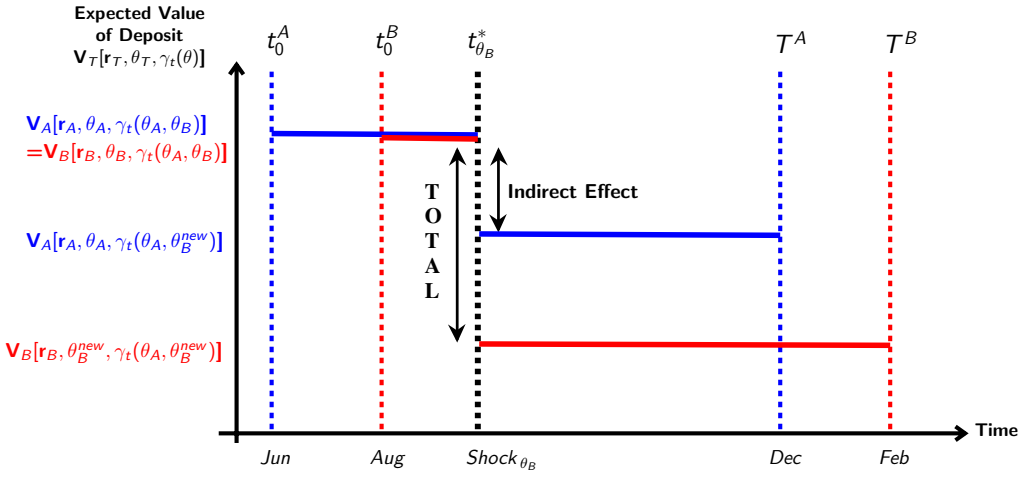

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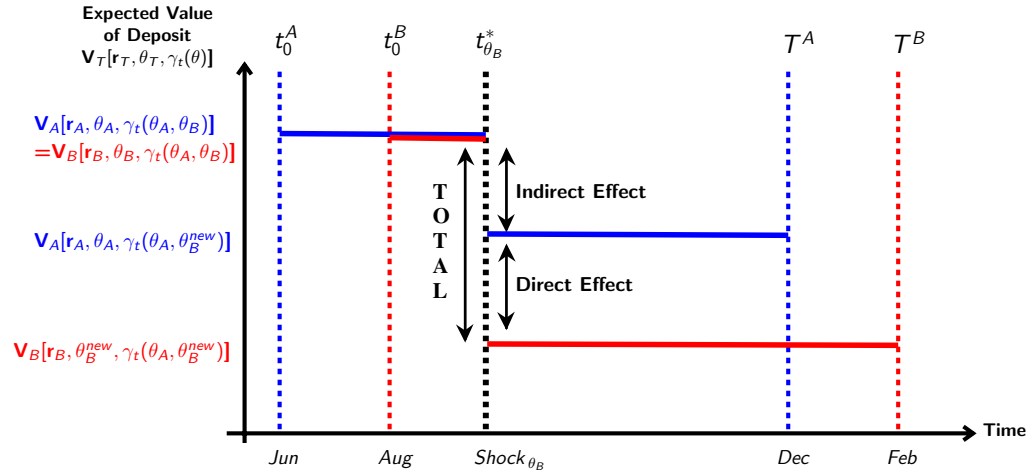
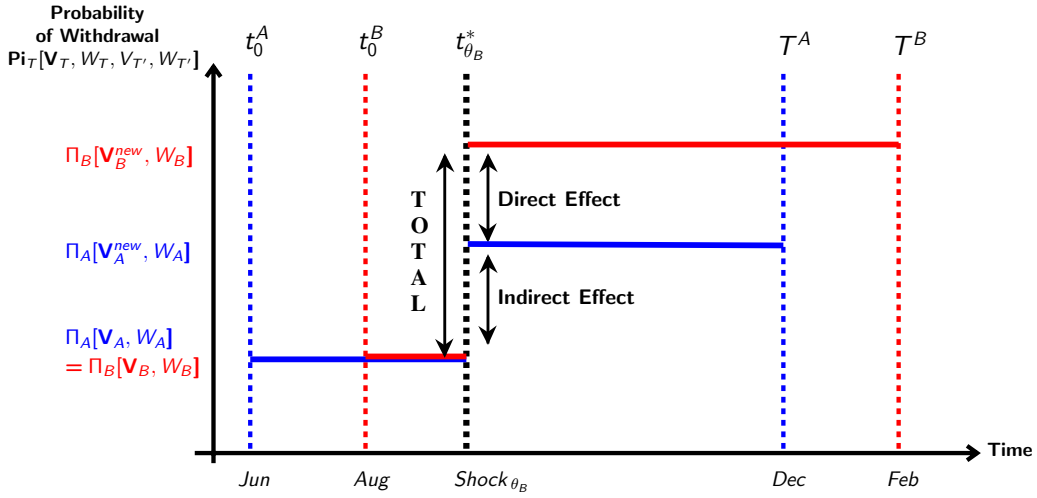


Direct and Indirect Effects in Withdrawal Probabilities



DATA

Data

- Daily deposit-level data with detailed contract and depositor characteristics on the entire universe of time-deposit accounts for retail customers of a large Greek bank.
  - → From January 1, 2014 to March 31, 2015
  - → More than 100,000 accounts → National-level coverage
  - → Time-deposits $>$ 50% of all deposits
  - → Deposit insurance up to €100,000
    - 95% of time deposits fully insured
    - Median balance 37,000€
  - → Maturities of 3, 6 and 12 months with average interest rates of 2%.

* Statistics masked to preserve the bank's anonymity.

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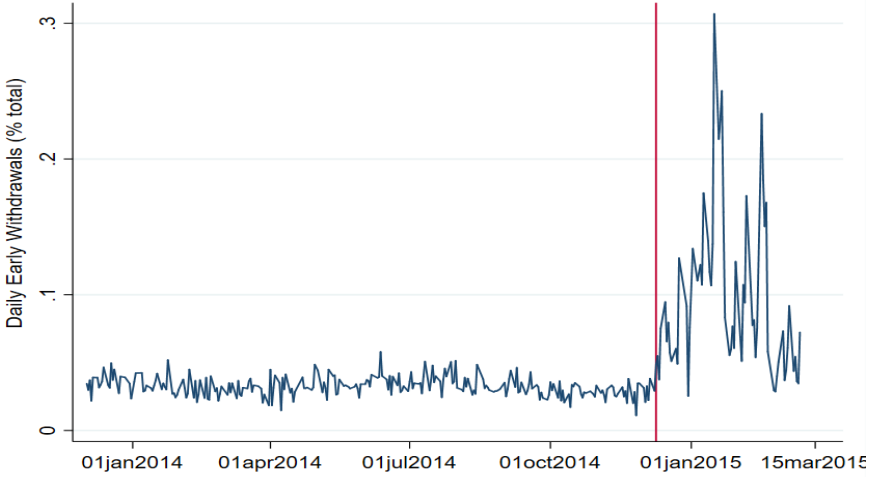
2. Time deposits have a **maturity date**.
   - → Exposure to uncertainty has a clear expiration date.
   - → Depositors may have different withdrawal motives depending on their maturity dates.

Daily % time-deposits withdrawn before maturity

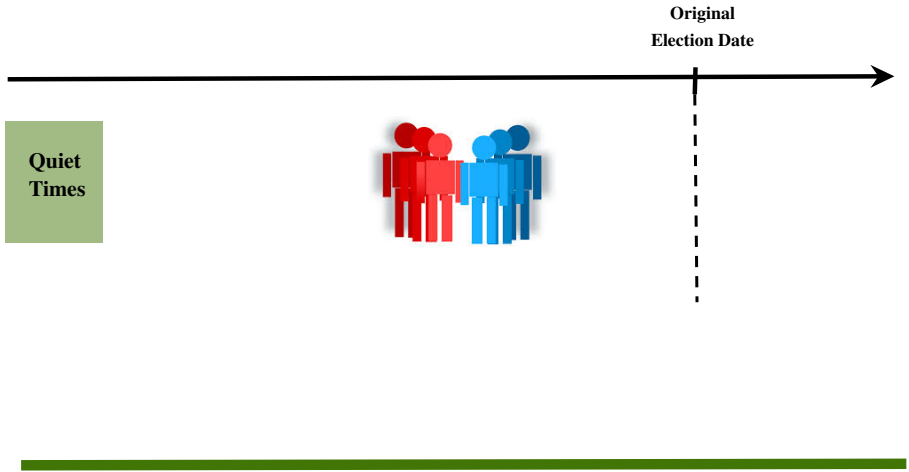


Vertical line: surprise election announcement on December 8, 2014.

UNCERTAINTY PERIOD:

Backing Out Fundamental Motives

Empirical Approach using Time Deposits



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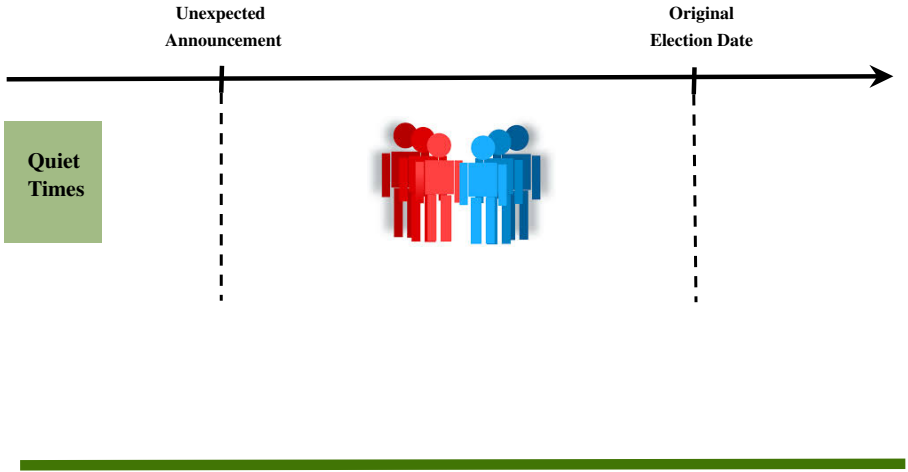

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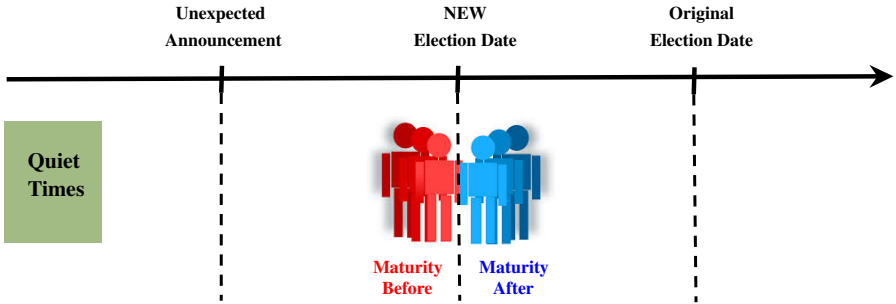

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- Certainty about left-wing party winning election.
  - → Prices (stocks, CDS) adjusted immediately after announcement, but not at election date.
- Party to come into power after the election advocated for Grexit, nationalization of banks and capital controls.
  - → However, new policies could be implemented before election date.
  - → **Changes in fundamentals after election, but not before.**

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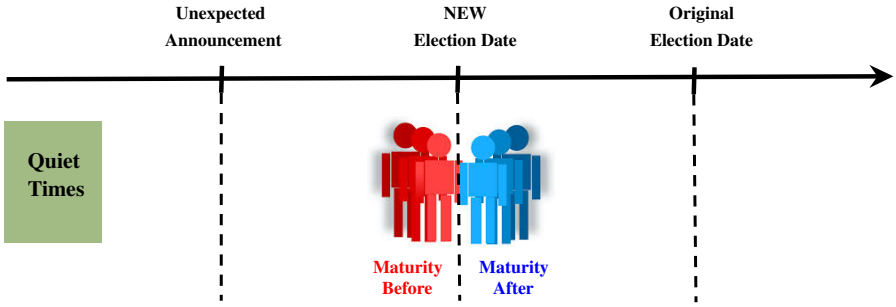
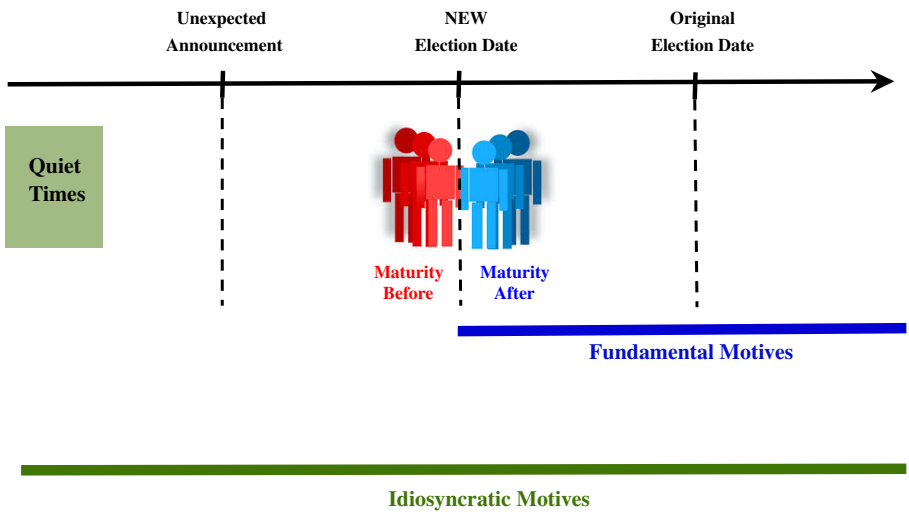


Idiosyncratic Motives

Empirical Approach using Time Deposits



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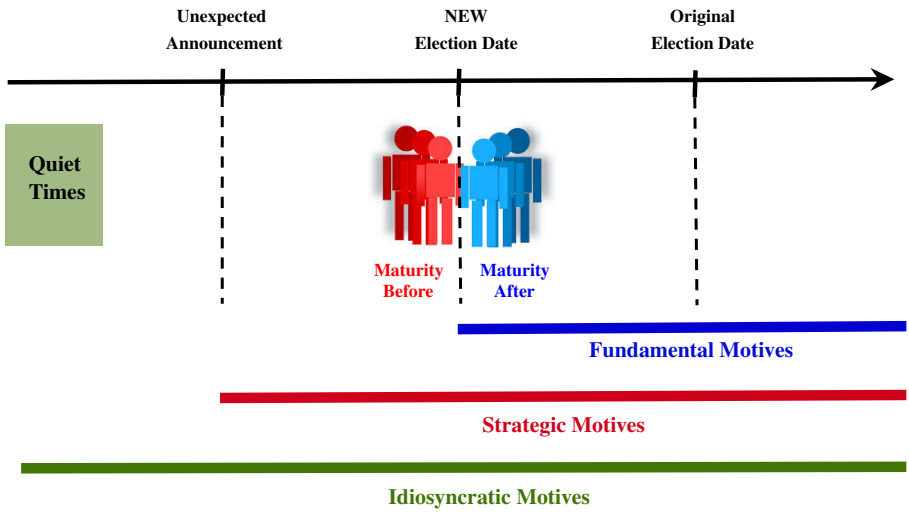

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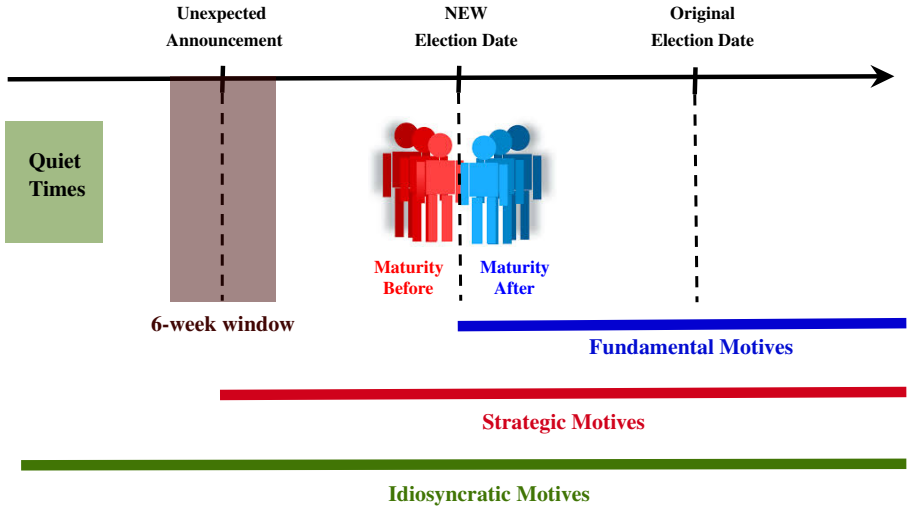

Difference-in-Differences

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  - *Exposed* to fundamental motives.
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- **Post (Pre) Period:** 3-weeks after (before) announcement
  - We compare withdrawal behavior before and after the announcement.
- (Weak) Assumption for identification:
  - Liquidity, bank fundamentals, strategic motivation... All affect both groups of depositors (red and blue in the figure) the same way.

Raw Data

	Matures before election (Control)	**Matures after election** (Treated)
6-weeks before announcement (parallel trends)	0.40 %	0.49 %
3-weeks before announcement (pre-period)	1.00 %	1.07 %
3-weeks after announcement (post-period)	0.38 %	2.78 %
Accounts (N)	>8,000	>8,000

Raw Data + Counterfactual Group

	Treatment Period (uncertainty)		**Control Period** (quiet times)	
	Control Group (No Policy Uncertainty)	**Treated Group** (Policy Uncertainty)	**Control Group** (No Policy Uncertainty)	**Treated Group** (No Policy Uncertainty)
Before t_0	0.40 %	0.49 %	0.40 %	0.41 %
Between t_0 **and** t_A	1.00 %	1.07 %	0.66 %	0.64 %
Between t_A **and** t_1	0.38 %	2.78 %	0.37 %	1.40 %
Observations (N)	>8,000	>8,000	>8,000	>8,000

DiD(iD) Results

$$\begin{aligned} Withdrawal_{it} =& \beta_0 + \beta_1 \cdot Uncertainty_i + \beta_2 \cdot Exposed_i + \beta_3 \cdot Post_t + \beta_4 \cdot Uncertainty_i \\ &+ \beta_4 \cdot Uncertainty_i + Exposed_i + \beta_5 \cdot Uncertainty_i \cdot Post_t + \beta_6 \cdot Exposed_i \cdot Post_t \\ &+ \beta_F \cdot Uncertainty_i \cdot Exposed_i \cdot Post_t + \gamma \cdot X_{it} + \epsilon_{it} \end{aligned}$$

	Prob. of early withdrawal	
DDD Coefficient	0.0127***	0.0127***
	(0.003)	(0.003)
Depositor controls	No	Yes
Deposit controls	No	Yes
Observations	>50,000	>50,000

⇒ **Fundamental motives increase the probability of withdrawal by 192% relative to the baseline (to 29% annualized)**

DEPOSITOR COMPENSATION
AFTER DETERIORATION OF FUNDAMENTALS

First Step: How much do depositors react to changes in monetary incentives associated with early withdrawals?

- **We exploit the discontinuity in the bank's schedule of accrued interest payments.**
  - Details in the paper.
- We get an interest rate-demand elasticity for time-deposits of 0.48
  - U.S. insured-deposit demand elasticity estimate = 0.56 (Egan et al. 2017)
- Withdrawal decision is sensitive to the monetary cost.
  - Scope for offering monetary incentives to prevent deposit withdrawal

Second Step: Given the interest-demand elasticity, what changes in rates would generate same % withdrawals?

What change in monetary incentives could explain an equivalent fraction of withdrawals due to strategic and fundamental motives?

⇒ **Strategic Motives:** equivalent to decreasing the penalty for early withdrawals by 293€ (0.76% of balance).

⇒ **Fundamental Motives:** equivalent to decreasing the penalty for early withdrawals by 612€ (1.6% of total balance).

Conclusions: Cost of Stabilizing Deposits

- Preventing depositors from withdrawing before maturity could be achieved by increasing the interest rates on their time deposits (e.g., additional payment at maturity).

- Stopping withdrawals during the six-week window after 136% increase in CDS would have cost our Bank 2.36% of the value of time deposits.

  → Implying a cost of capital (at an annualized rate) exceeding 50%

  → Note: this is a lower bound (e.g., increasing the rate may signal trouble and trigger additional strategic withdrawals).

- Time deposits more volatile than regulation accounts for.

  → E.g., Basel III excludes time deposits from cash outflow calculations for Liquidity Coverage Ratios.

Thank you for listening.
Looking forward to discussion and comments.