

The Impact of Unconventional Monetary Policy On Firm Financing Constraints: Evidence from the Maturity Extension Program

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Unconventional Monetary Policy

- ▶ The Fed Fund Rate hits the Zero Lower Bound (ZLB) since 2008
- ▶ The Federal Reserve implemented Large Scale Assets Purchase Programs
- ▶ Goals of the programs
 - ▶ offset the disruption of private sector intermediation
 - ▶ limit the potential for firesales
 - ▶ stimulate the economy

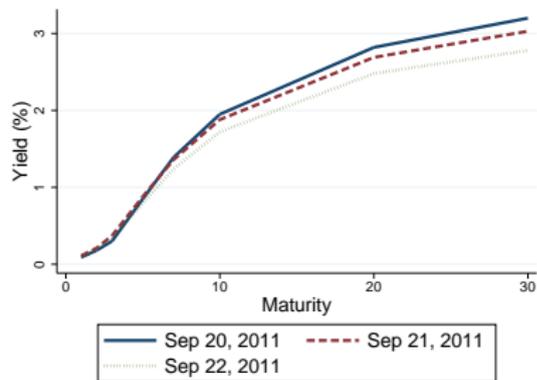
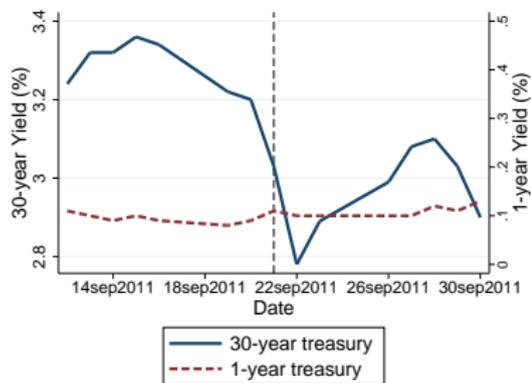
Unconventional Monetary Policy

- ▶ Previous literature documents the effects on yields
 - ▶ e.g. Krishnamurthy and Vissing-Jorgensen (2013), Cahill et. al. (2013)
- ▶ This paper:
 - ▶ examine the effects of one of these programs on firm financing and real activities using micro level data
 - ▶ any impact on firms' stock prices?
 - ▶ affect borrowing, bond issuing, and risk seeking?
 - ▶ how about investment and employment?
 - ▶ financial constrained vs unconstrained firms?

Maturity Extension Program

- ▶ MEP was announced at 2:30pm on Sept 21, 2011
- ▶ Sell \$400 billion of shorter-term Treasury securities
- ▶ Use the proceed to buy longer-term treasury securities
- ▶ Why MEP?
 - ▶ Largest fraction (33%) of purchase between 10-30 years (13% of total outstanding long-term treasuries)
 - ▶ Effect on longer-term yield is the biggest (excluding QE1)

Yield Changes around MEP Announcement



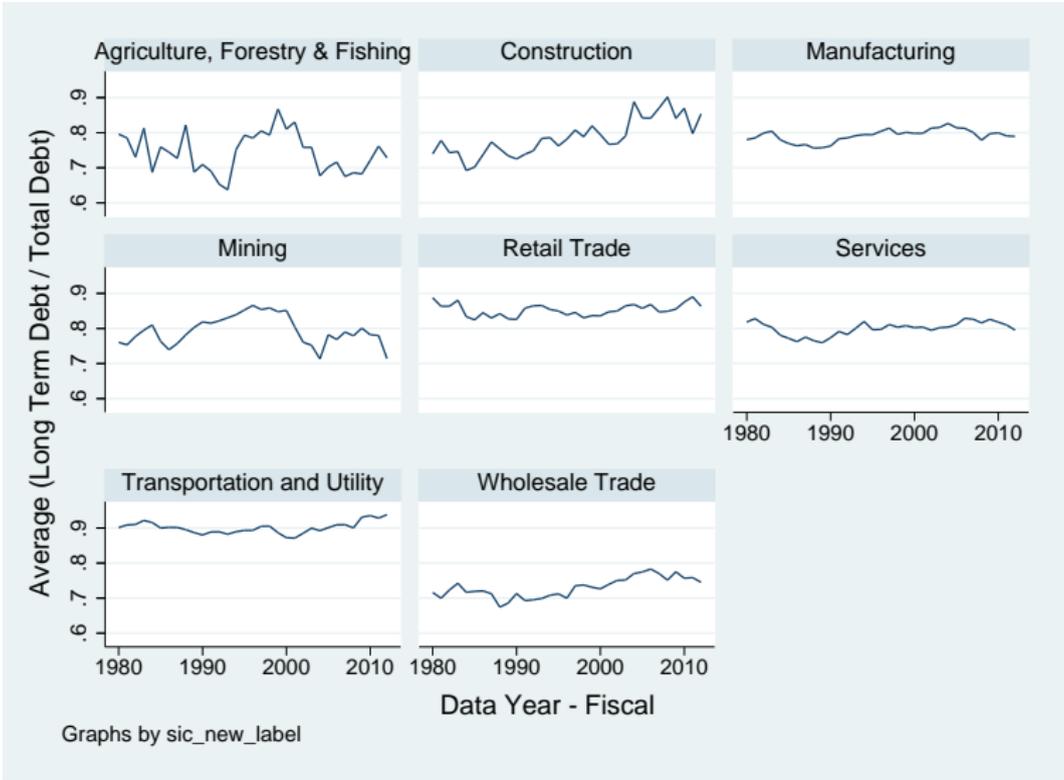
Gap-filling

- ▶ Firms issue more bonds to fill the gap (Greenwood, Hanson, and Stein (2010))
 - ▶ Segmented markets
 - ▶ Preferred habitat (Vayanos and Vila 2009)
- ▶ A flatter yield curve benefits long-term debt dependent firms
 - ▶ Returns of stocks higher for those firms at announcement?
 - ▶ Do they borrow more?
 - ▶ Do they invest more?

Measure of Long-term Debt Dependence

- ▶ Compustat annual data (non-financial firms)
- ▶ Long-term debt: mature one year or longer at issuance (DLTT + DD1, Greenwood, Hanson and Stein, 2010)
- ▶ Long-term debt ratio: $\text{long-term debt} / (\text{long-term debt} + \text{short-term debt})$
 - ▶ Average for all observations till 2007
 - ▶ Average for all observations till 2011
 - ▶ Last available observation before 2007

Long-term Debt Dependence Across Sectors

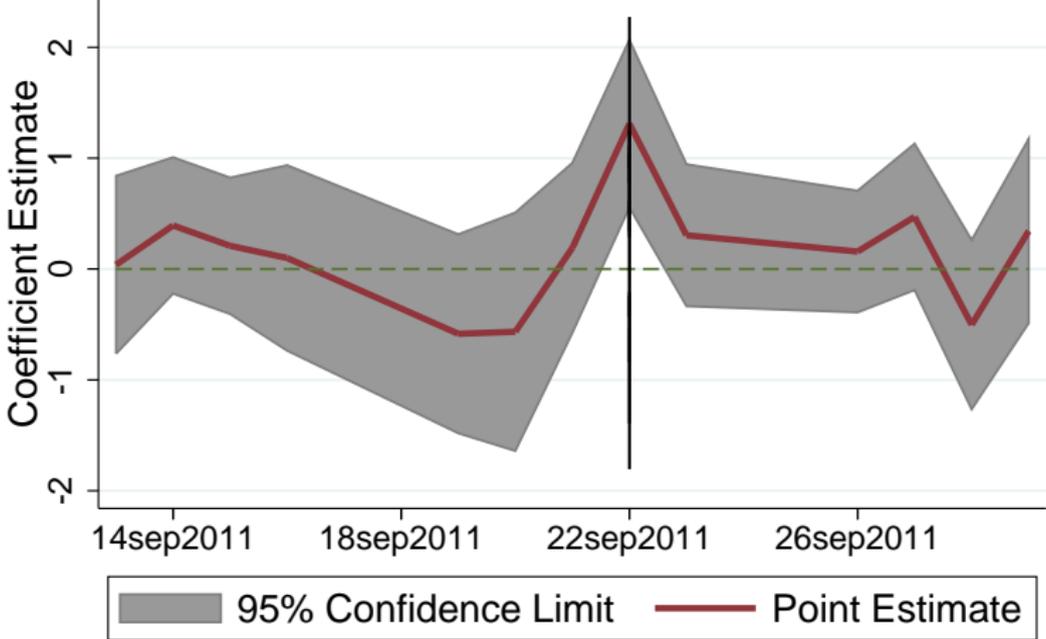


Event Study

| | Abnormal Returns on Sept. 22, 2011 | | | | | | |
|--|------------------------------------|---------------------|---------------------|---------------------|---------------------|-----------------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Long-Term Debt Dependence (One-Year Cutoff) | 0.85** (0.39) | 0.91** (0.43) | 0.90** (0.36) | 0.93*** (0.36) | 1.05*** (0.37) | 0.96** (0.38) | 1.61*** (0.50) |
| Market Capitalization (billions) | | | -0.0095 (0.015) | 0.0079 (0.015) | 0.0053 (0.021) | 0.0048 (0.0080) | -0.024 (0.023) |
| Book-to-Market Ratio | | | -0.62*** (0.19) | -0.60*** (0.19) | -0.45* (0.23) | -0.37 (0.35) | -0.73*** (0.17) |
| Total Debt (Normalized by Total Assets) | | | | -0.14 (0.086) | -0.17 (0.13) | -0.024 (0.055) | -0.11 (0.11) |
| Fixed Effects | | SIC 3 | SIC 3 |
| Extra Controls | No | No | No | No | Yes | Yes | Yes |
| Long-Term Debt Average | pre-2007 average | pre-2007 average | pre-2007 average | pre-2007 average | pre-2007 average | pre-2007 average last | before Sep 21, 2011 |
| Control Variable Average | pre-2007 average | pre-2007 average | pre-2007 average | pre-2007 average | pre-2007 average | available pre-2007 | before Sep 21, 2011 |
| Observations | 2618 | 2618 | 2492 | 2492 | 2373 | 2373 | 2759 |
| R-Squared | 0.003 | 0.145 | 0.150 | 0.150 | 0.154 | 0.151 | 0.155 |

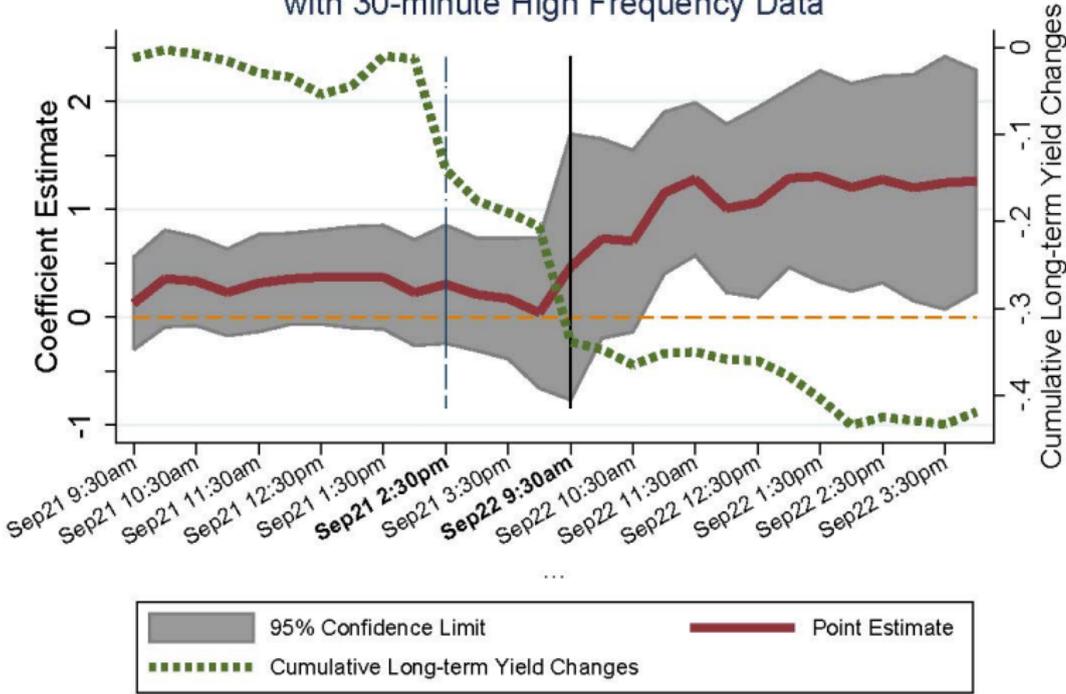
Coefficient Estimates in a 15-day Window

Regression Results around Event Window
With All Control Variables



High-frequency Data

Regression Results around Event Window with 30-minute High Frequency Data



Impact on Firm's Borrowing

- ▶ Effects on abnormal returns:
 - ▶ higher for firms more dependent on long-term debts
- ▶ Effects on firm activities:
 - ▶ increase borrowing?
- ▶ Difference-in-difference:
 - ▶ Panel of firms between 2007 and 2013, annual frequency

$$y_{it} = \beta_1 DD_t + \beta_2 DD_t \times Is_i + \beta_3 X_{it} + \beta_4 DD_t \times X_i + \varepsilon_{it}$$

- ▶ y_{it} : growth in long-term debts
- ▶ $DD_t = 1$ if year is 2012
- ▶ X_{it} : firm characteristics

MEP and Firm Borrowing

| | (1) | (2) |
|---|-----------------------------------|-----------------------------------|
| | Long-Term Debt Growth | Short-Term Debt Growth |
| Long-Term Debt Dependence * MEP | 0.33*** (0.12) | 0.34 (0.25) |
| Market Capitalization (billions) * MEP | -0.0067 (0.0044) | -0.0020 (0.019) |
| Book-to-Market Ratio * MEP | 0.022 (0.015) | 0.015 (0.038) |
| Total Debt (Normalized by Total Assets) * MEP | 0.018 (0.016) | 0.024 (0.068) |
| Total Assets * MEP | -0.0024 (0.0053) | -0.011 (0.022) |
| Net Income Growth * MEP | 0.12* (0.072) | 0.093 (0.22) |
| Return on Assets * MEP | 0.025 (0.39) | -0.61 (0.81) |
| Income over Assets * MEP | 0.028 (0.046) | 0.091 (0.13) |
| Average Q * MEP | -0.0033 (0.0026) | 0.0053 (0.0065) |
| Short-Term Financial Constraint * MEP | 0.0019 (0.031) | -0.0013 (0.068) |
| Capital Intensity * MEP | 0.36 (0.55) | 0.050 (1.70) |
| Other Controls | time varying firm characteristics | time varying firm characteristics |
| Fixed Effects | firm and time fixed effects | firm and time fixed effects |
| Number of Observations | 16498 | 6129 |

MEP, Firm Borrowing, and Financial Constraint

| (1) | |
|---|--------------------------|
| Variables | Long-term Debt Growth |
| Long-Term Debt Dependence * MEP | 0.31*** (0.10) |
| Age-Size Index* MEP | 0.00010** (0.000048) |
| Age-Size Index*Long-Term Debt Dependence * MEP | -0.00014** (0.000057) |
| Number of Observations | 16219 |

External Financing

- ▶ Did firms more dependent on long-term debt issue more corporate bonds during MEP?
- ▶ Corporate bond data: FISD
 - ▶ typically long-term debts (over 90% with 30 years+)
 - ▶ infrequent (median 1 bond per year conditional on issuing)
- ▶ Same difference-in-difference regression and controls as before with a different dependent variable
 - ▶ 1 if a firm issues one or more bond in a given year

External Financing

| Variables | (1) No Controls | (2) AR(1) | (3) Firm Fixed Effects | (4) Firm Controls |
|------------------------------------|----------------------|---------------------|---------------------------|----------------------|
| Long-term Debt Dependence * MEP | 0.050*** (0.0089) | 0.049*** (0.010) | 0.045*** (0.0095) | 0.040*** (0.015) |
| Observations | 35771 | 29152 | 35771 | 21593 |
| R-squared | 0.013 | 0.163 | 0.469 | 0.502 |

Did demand for riskier debt increase “reach for yield”?

- ▶ Lower yields prompts yield seeking investors (e.g. insurance companies) to “reach for yield” (e.g. Becker and Ivashina (2014), Hanson and Stein (2015))
 - ▶ Insurance companies hold about 60% of corporate debts
- ▶ Insurance companies required to post more capital reserve for higher risk assets
 - ▶ A- or above: \$0.30 per \$100 invested
 - ▶ BBB- to BBB+: \$1.10 per \$100 invested
- ▶ “Reaching for yield” increases demand of A- bonds and thus lowers their bond spread.

MEP and Bond Spread

| Variables | (1) Category 1 | (2) Category 1 | (3) AAA to BBB+ | (4) Cats 1 & 2 | (5) Cats 1 & 2 |
|-----------------|--------------------|-------------------|--------------------|-------------------|---------------------|
| A- Rating*MEP | -0.231** (0.11) | -0.295* (0.17) | | | -0.270*** (0.10) |
| BBB+ Rating*MEP | | | 0.149 (0.14) | | |
| BBB- Rating*MEP | | | | 0.0961 (0.13) | |
| Observations | 738 | 738 | 994 | 1,590 | 1,590 |
| R-Squared | 0.811 | 0.819 | 0.817 | 0.826 | 0.826 |

Firm Investment and Employment

- ▶ Did firms invest more and hire more during MEP?
- ▶ Same difference-in-difference regression and controls as before with different dependent variables
 - ▶ Growth in property, plants and equipments
 - ▶ Growth in number of employees

Firm Investment and Hiring

| | (1) | (2) | (3) | (4) |
|---|-----------------------------------|-----------------------------------|-----------------------------------|---|
| | Growth in PPENT | Growth in Employees | Growth in Cash Holdings | Growth in Dividend and Share Repurchase |
| Long-term Debt Dependence * MEP | 0.085** (0.039) | 0.057** (0.025) | 0.012 (0.087) | 0.0081 (0.16) |
| Market Capitalization (billions) * MEP | 0.00018 (0.0016) | -0.00066 (0.0013) | -0.00082 (0.0049) | -0.0020 (0.0093) |
| Book to Market Ratio * MEP | 0.016* (0.0096) | -0.00011 (0.0054) | -0.024 (0.020) | 0.0063 (0.030) |
| Total Debt (normalized by total assets) * MEP | 0.016** (0.0066) | 0.014** (0.0055) | 0.00022 (0.018) | -0.037 (0.037) |
| Total Assets * MEP | -0.0043* (0.0023) | -0.0038** (0.0018) | 0.0046 (0.0063) | 0.0023 (0.011) |
| Net income growth * MEP | 0.020 (0.031) | 0.011 (0.018) | 0.10 (0.061) | 0.051 (0.15) |
| Return on Assets * MEP | -0.22 (0.15) | 0.072 (0.087) | -0.18 (0.32) | 0.33 (0.70) |
| Income over assets * MEP | 0.020 (0.020) | -0.0098 (0.014) | -0.024 (0.047) | -0.037 (0.074) |
| Average Q * MEP | -0.000091 (0.0011) | 0.00030 (0.00072) | -0.0011 (0.0023) | -0.0024 (0.0035) |
| Short-term Financial Constraint * MEP | 0.0090 (0.016) | -0.0061 (0.0090) | -0.013 (0.024) | -0.011 (0.046) |
| Capital Intensity * MEP | -0.059 (0.21) | -0.31** (0.14) | -0.76 (0.50) | -1.54** (0.78) |
| Controls | time varying firm characteristics |
| Fixed Effects | firm and time fixed effects | firm and time fixed effects | firm and time fixed effects | firm and time fixed effects |
| Number of Observations | 26128 | 24642 | 25814 | 13723 |

Firm Investment and Hiring, and Financial Constraint

| Variables | (1) Investment Growth | (1) Employment Growth |
|---|--------------------------|--------------------------|
| Long-Term Debt Dependence * MEP | 0.070* (0.042) | 0.058** (0.025) |
| Age-Size Index* MEP | 0.000033** (0.000014) | 0.000016 (0.000012) |
| Age-Size Index*Long-Term Debt Dependence * MEP | -0.000036* (0.000021) | -0.000014 (0.000019) |
| Number of Observations | 21333 | 20256 |

Conclusion

- ▶ Exploiting the variation on firms' dependence on long-term debts to examine the effects of an unconventional monetary policy (MEP)
- ▶ Stock returns of firms more dependent on long-term debts reacted more positively to the announcement of MEP.
- ▶ More long-term debt dependent firms also had faster growth in long-term debts and bonding issuance during MEP.
- ▶ These firms also invest more and hire more during MEP.
- ▶ Evidence of less financially constrained firms benefited more from the policy

MEP and Bond Buying Program

| Weights used in the purchase of the Treasury securities during the MEP bond buying program | | | | |
|--|------------|-------------|-------------|--------------------|
| 6-8 years | 8-10 years | 10-20 years | 20-30 years | TIPS 6-30 years |
| 32% | 32% | 4% | 29% | 3% |
| Outstanding Stock of Treasuries, 2011 (\$billion) | | | | |
| | 5-7 years | 7-10 years | >=10 years | |
| | 1,136 | 1,053 | 1,017 | |

Sources: NY Fed (http://www.newyorkfed.org/markets/opolicy/operating_policy_120620.html)

US Treasury: <http://www.treasury.gov/resource-center/data-chart-center/quarterly-refunding/Documents/Nov%202013%20QR%20-%20TBAC%20Discussion%20Charts%20%28Final%29.pdf>

Sensitivity to Monetary Shocks

- ▶ Measured by the slope coefficient γ_{1i} of the following regression

$$r_{it} = \gamma_{0i} + \gamma_{1i}ms_{it} + \nu_{it}$$

- ▶ ms_{it} : unexpected monetary shocks identified using Fed Fund futures
- ▶ A similar measure as in Gorodnichenko and Weber (2013)

Summary Statistics: Control Variables

| Variable | Description | No. Obs. | MEAN | SD | 5% | 25% | 50% | 75% | 95% |
|----------|---|----------|-------|-------|-------|--------|------|------|-------|
| ls | Long-term Debt Share | 3304 | 0.82 | 0.25 | 0.23 | 0.74 | 0.92 | 1.00 | 1.00 |
| mktcap | Market Capitalization (billions) | 2570 | 1.58 | 4.24 | 0.02 | 0.11 | 0.35 | 1.08 | 6.49 |
| b2m | Book to Market Ratio | 2569 | 0.56 | 0.39 | 0.11 | 0.29 | 0.49 | 0.75 | 1.24 |
| td | Total Debts (normalized by total assets) | 2719 | 0.36 | 0.96 | 0.000 | 0.003 | 0.03 | 0.22 | 2.00 |
| ldebt | Long-term Debts (normalized by total assets) | 2637 | 0.27 | 0.28 | 0.00 | 0.07 | 0.20 | 0.37 | 0.80 |
| at | Total Assets | 2723 | 1.16 | 2.85 | 0.01 | 0.05 | 0.22 | 0.80 | 5.72 |
| nig | Net Income Growth | 2607 | 0.19 | 0.35 | -0.32 | 0.06 | 0.14 | 0.30 | 0.81 |
| roa | Return on Assets | 2453 | 0.00 | 0.09 | -0.18 | -0.018 | 0.03 | 0.05 | 0.07 |
| ni2a | Income over assets | 2640 | -0.03 | 0.80 | -0.85 | 0.06 | 0.15 | 0.21 | 0.37 |
| Q | Average Q | 2548 | 6.35 | 16.08 | 1.18 | 1.58 | 2.44 | 4.83 | 18.08 |
| i2s | Investment Opportunity | 2679 | 0.40 | 1.59 | 0.01 | 0.03 | 0.06 | 0.15 | 1.19 |
| kz4 | Kaplin-Zingales Score | 2634 | -0.05 | 4.64 | -3.98 | 0.01 | 0.82 | 1.47 | 2.45 |
| rp2s | Short-term Financial Constraint | 2674 | -0.13 | 1.18 | -0.44 | 0.00 | 0.07 | 0.13 | 0.24 |
| d2a | Capital Intensity | 2640 | 0.06 | 0.05 | 0.02 | 0.03 | 0.05 | 0.07 | 0.14 |

More Dates

(A) Around Same Time of Year

| | | | | | | | | | | | |
|------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|
| 2009 | Sep 14 | Sep 15 | Sep 16 | Sep 17 | Sep 18 | Sep 21 | Sep 22 | Sep 23 | Sep 24 | Sep 25 | Sep 28 |
| | -0.94 | -0.21 | 0.29 | -0.13 | 0.68 | -0.19 | -0.77* | -0.10 | 0.51 | -0.61 | 0.28 |
| | (0.61) | (0.51) | (0.45) | (0.46) | (0.52) | (0.49) | (0.42) | (0.42) | (0.44) | (0.37) | (0.58) |
| 2010 | Sep 14 | Sep 15 | Sep 16 | Sep 17 | Sep 20 | Sep 21 | Sep 22 | Sep 23 | Sep 24 | Sep 27 | Sep 28 |
| | 0.100 | -0.30 | -0.31 | 0.55 | 0.28 | -0.43 | -0.31 | 0.29 | 0.11 | -0.40 | 0.38 |
| | (0.25) | (0.29) | (0.36) | (0.35) | (0.57) | (0.43) | (0.42) | (0.26) | (0.31) | (0.37) | (0.29) |
| 2012 | Sep 14 | Sep 17 | Sep 18 | Sep 19 | Sep 20 | Sep 21 | Sep 24 | Sep 25 | Sep 26 | Sep 27 | Sep 28 |
| | 0.17 | -0.62* | -0.55 | -0.14 | -0.091 | -0.46 | -0.31 | -0.0095 | -0.30 | 0.17 | -0.080 |
| | (0.38) | (0.33) | (0.50) | (0.38) | (0.41) | (0.43) | (0.46) | (0.29) | (0.30) | (0.35) | (0.28) |

(B) Around Announcement of Different LSAPs

| | | | | | | | | | | | |
|------|--------|--------|--------|--------|--------|--------|----------------|--------|---------|--------|--------|
| QE2 | Oct 27 | Oct 28 | Oct 29 | Nov 1 | Nov 2 | Nov 3 | Nov 4 | Nov 5 | Nov 8 | Nov 9 | Nov 10 |
| 2010 | 0.23 | 0.49 | 0.24 | -0.47 | 0.50 | 0.035 | -0.050 | -0.34 | -0.92** | 0.18 | 0.25 |
| | (0.42) | (0.36) | (0.39) | (0.40) | (0.31) | (0.40) | (0.35) | (0.54) | (0.42) | (0.34) | (0.35) |
| MEP | Sep 14 | Sep 15 | Sep 16 | Sep 19 | Sep 20 | Sep 21 | Sep 22 | Sep 23 | Sep 26 | Sep 27 | Sep 28 |
| 2011 | 0.27 | 0.17 | 0.13 | -0.63 | -0.58 | 0.12 | 1.05*** | 0.24 | 0.21 | 0.39 | -0.53 |
| | (0.29) | (0.29) | (0.41) | (0.43) | (0.50) | (0.40) | (0.37) | (0.33) | (0.27) | (0.33) | (0.36) |
| QE3 | Sep 6 | Sep 7 | Sep 10 | Sep 11 | Sep 12 | Sep 13 | Sep 14 | Sep 17 | Sep 18 | Sep 19 | Sep 20 |
| 2012 | 0.85* | -0.65* | -0.064 | 0.41 | 0.15 | -0.83* | 0.17 | -0.62* | -0.55 | -0.14 | -0.089 |
| | (0.48) | (0.35) | (0.42) | (0.37) | (0.38) | (0.47) | (0.38) | (0.33) | (0.50) | (0.38) | (0.41) |