A Note on the Impact of Unconventional Monetary Policy Shocks in the US on Emerging Market REITs: A Qual VAR Approach

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Abstract
In this paper, we estimate a Qualitative Vector Autoregressive (Qual VAR) model, which combines binary information of Quantitative Easing (QE) announcements with an otherwise standard VAR model that includes US and emerging market Real Estate Investment Trusts (REITs) returns. The Qual VAR uncovers the Federal Reserve’s latent, unobservable propensity for QE and generates impulse responses for the emerging market REITs returns. The results show that QE has (strong) positively significant, but short-lived, effects on the returns of emerging market REITs.

Keywords: Qual VAR, Unconventional Monetary Policy, Emerging Markets, REITs
JEL Classification: C32, E52, R33

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1. Introduction

The nexus between monetary policy, movement in real estate prices, and real economy play a central role in understanding the wealth channel of monetary policy transmission of shocks. The experiences of the recent financial crisis also highlighted the cascading effects of US monetary policy and economic dynamics on emerging markets macroeconomic and financial variables, including Real Estate Investment Trusts (REITs) returns. In this paper, we combine the qualitative information with the standard vector autoregression model to unveil the unobserved impact of the US Federal Reserves’ unconventional policy on emerging market REITs returns.

The securitized real estate markets, i.e., REITs, have recently registered exponential growth. With more than $1.22 trillion of equity capitalization represented by global real estate markets as of July of 2016,¹ they have proved to be an important asset class in the international portfolio management (Brounen et al. 2009; French et al. 2012). Emerging market REITs, in particular, are attractive because they offer diversification opportunities to investors of emerging markets as well as developed markets (Barry and Rodriguez 2004). This is because emerging market REITs provide significant gains to the investors on the risk-adjusted basis.² Furthermore, the impact of the Federal Reserve’s unconventional monetary policy actions – forward guidance or Quantitative Easing (QE) announcements – impact the emerging markets through the signalling and portfolio balance channels (Neely 2015).³

One of the major challenges in assessing the impact of the QE announcements on the emerging market REITs is that the QE by design contained qualitative information about the monetary policy stance. As a result, the true impact of the QE announcements on the REITs remains unobserved. In this paper, we precisely address this challenge. We model the effects QE announcements as unobserved and estimate the effects of this latent factor on the emerging market REITs returns. While significant positive impact of unconventional monetary policy on housing and REITs of developed economies have been recently depicted (see for example, Claus et al., (2014), Gabriel and Lutz (2015), Huber and Punzi (2016), and Rahal (2016)), to the best of our knowledge, there exists no studies that have looked into the impact of the US unconventional monetary policy on real estate markets of emerging countries.

Against the backdrop, for the first time in the literature, following the works of Meinusch and Tillmann (2016) and Tillmann (2016), we use the Qualitative Vector Autoregressive (Qual VAR) model (developed by Dueker (2005)) to study the impact of Quantitative Easing (QE) announcements, i.e., unconventional monetary policy on of returns of REITs of emerging markets. The Qual VAR allows us to integrate binary information on QE announcements into an otherwise standard monetary policy VAR containing US real economic activity and REITs returns of emerging markets.⁴ The Qual VAR model uncovers the latent, unobservable

¹ Source: National Association of Real Estate Investment Trusts (NAREIT).
² See, Barry and Rodriguez (2004); Ooi and Liow (2009); Hiang and Adair (2009); Pham (2012).
³ An QE announcement could signal an easing of expected future interest rates which affects the REITs returns. The portfolio balance channel operates by pushing down the excess yields on the securities announced to be purchased and those of substitutes, until a new equilibrium is reached (See, Neely (2015) for further details).
⁴ In the process, the Qual VAR combines the event studies and VAR based approaches used to study the impact of unconventional monetary policy (see for example, Bhattarai and Neely (2016) for a detailed review of the literature associated with unconventional monetary policy).
propensity for QE through Markov Chain Monte Carlo techniques, which in turn, is used to derive impulse response functions for a QE shock to analyze the impact on the REITs returns of the emerging markets. Note that, Tillmann (2016) showed that capital inflows originating in the US, exchange rates, equity prices and bond prices of emerging market economies are significantly affected by QE. Our short note, adds an additional dimension to the work of Tillmann (2016), by analysing REITs of emerging markets, given its importance, as discussed in the above paragraph.

The remainder of this paper is organized as follows: Section 2 briefly outlines the Qual VAR model, while the data set, the identification of monetary policy shocks and results are discussed in Section 3. Section 4 concludes the paper.

2. The Qualitative Vector Autoregressive (Qual VAR) Model

Suppose we observe a qualitative variable, $y \in \{0,1\}$, which is driven by a continuous latent variable, $y^*$, such that:

$$y_t = 0 \text{ iff } y^*_t \leq 0$$

$$= 1 \text{ iff } y^*_t > 0$$

(1),

along with:

$$y^*_t = \Psi(L)y^*_{t-1} + \Gamma(L)X_{t-1} + \epsilon_t$$

(2)

$$\epsilon \sim N(0,1),$$

where $X_{t-1}$ is a set of explanatory variables, and $\Psi(L)$ and $\Gamma(L)$ are lag polynomials. The qualitative data used for $y_t$ are the QE announcements dates (details of which are discussed in the next section). Then, as described in Dueker (2005) and Dueker and Assenmacher-Wesche (2010), a Qual VAR model with $k$ variables and $p$ lags is expressed as a standard VAR:

$$\Phi(L)Y_t = \epsilon_t$$

(3),

with $\epsilon_t \sim \text{Normal}(0, \Sigma)$, and where $Y_t$ is a $k \times 1$ vector consisting of macroeconomic data, $X_t$, plus the latent business cycle turning point index $y^*$; $\Phi(L)$ is a set of $k \times k$ matrices from $L = 0, \ldots, p$, with the identity matrix at $L = 0$, i.e., the VAR regression coefficients are in $\Phi(L)$.

The parameters that require conditional distributions for Markov Chain Monte Carlo (MCMC) estimation are $\Phi$, $y^*$ and $\Sigma$ (i.e., the covariance matrix), which in turn, involves a sequence of draws based on the following conditional distributions: (i) $\Phi$’s are assumed to be normally distributed with the mean and the variance given by the OLS estimates; (ii) For $\Sigma$, an inverted Wishart distribution is assumed; (iii) $y^*$ is required to be positive whenever $y$ is equal to one, and is assumed to follow a truncated normal distribution.

We can derive the conditional distribution of the latent variable, given the VAR coefficients. Then, the conditional distribution of the VAR coefficients is given by the OLS estimates, given the latent variable. A MCMC is adopted to estimate both the latent variable and the coefficient matrix simultaneously. A draw from either conditional distribution can be considered as a draw from the joint posterior distribution, following a sufficient number of iterations. As in Dueker
(2005), we use 10,000 iterations from which the first 2,000 are discarded to allow for convergence towards the posterior distribution. For further details, the reader is referred to Dueker (2005), and Dueker and Assenmacher-Wesche (2010).

3. Data, Identification and Results

Following Tillmann (2016), the Qual VAR model is estimated using monthly data covering the period of 2007:08 to 2013:03, with the start of the sample matching the outbreak of the US subprime crisis and the end corresponding to right before the first comments on the gradual exit from unconventional measures (tapering). During this period the Federal Reserve engaged in several rounds of QE, and Table 1, as derived from Tillmann (2016), lists the most important announcements. Note as in Tillmann (2016), we only include announcements that are associated with the easing of the monetary stance.

We construct a binary indicator variable, which takes the value of one in the month of a QE announcement and zero otherwise. The resulting latent propensity for QE is labelled as Latent QE. As in Tillmann (2016), besides the indicator of QE announcements, the VAR includes the growth rate of the seasonally-adjusted industrial production index (IP) and the 10-year Treasury constant maturity rate (Yield), with the data on these two variables derived from the FRED database of the Federal Reserve Bank of St. Louis. The final variable is the log-returns of the S&P Emerging Markets REITs Index (EM REITs) obtained from Datastream of Thomson Reuters.

Since the sample is short (i.e., 68 observations), we chose a parsimonious specification and estimate each VAR model with $p=3$ lags, which is enough to eliminate serial correlation in the residuals based on a multivariate $Q$-test. Coincidentally, Tillmann (2016) also used 3 lags. In order to derive the impulse responses of the US macroeconomic variables and emerging market REITs returns following an unconventional monetary policy shock, identification (of this shock) is required from the reduced form innovations of the estimated VAR model. To achieve this identification, we, as in Tillmann (2016), use a Cholesky factorization which orders variables as follows: IP, Latent QE, Yield, and emerging market REIT returns. This ordering implies that unconventional monetary policy affects the long-term yield and REITs returns of the emerging markets contemporaneously, while the policy itself responds with a lag of one month to the business cycle situation, as captured by the growth of industrial production.

For the Qual VAR model, the estimated propensity for QE is depicted in Figure (1b), with Figures 1(a), 1(c) and 1(d) plotting IP, Yield, and EM REITs respectively. The latent variable is found to track the predefined QE events quite well (as indicated by the shaded areas), to the extent that it even reflects a growing likelihood of QE in the months before each of the actual QE announcements.
Once the latent variable is uncovered from the Qual VAR, a standard VAR can be estimated in order to derive impulse response functions. These impulse responses following a one standard deviation shock to the latent QE are shown in Figure 2 for all four endogenous variables. We also plot 90 percent confidence bands generated from 10,000 bootstrap replications as in Tillmann (2016).

As can be observed from Figure 2, an unexpected QE, resulting in a significant increase in Latent QE for two months (Figure 2(b)), raises the growth rate of industrial production with the peak significant response occurring at the fifth month (0.13 percent), as observed from Figure 2(a). The yield reacts immediately upon the shocks and falls for the first three months, but the effect is insignificant, as depicted in Figure 2(c). Thus, economically speaking, QE had the intended consequences of increasing output growth and improving firms' long-term financing conditions (Tillmann, 2016).

Let us now turn to the responses of the REITs returns of the emerging markets. As can be seen from Figure 2(d), after a monetary easing, investors flows, with a delay of one month, into REITs of emerging economies pushing up the returns by 0.75 percent, with the effect staying significant for the second and third months only. In other words, QE affected emerging market REITs positively, but the effect was short-lived.

4. Conclusion

In this paper, we estimate a Qual VAR to analyze the impact of the Federal Reserve's unconventional monetary policy on the REITs returns of emerging markets. The Qual VAR, estimated on US macroeconomic and emerging market REITs data over the monthly period of 2007:08 to 2013:03, combines the binary information of QE announcements with the advantages of a standard monetary policy VAR. The results show that an unexpected increase in the Federal Reserve’s propensity to undertake QE, strongly increases REITs returns of the emerging markets, but the statistical significance of the effect is short-lived lasting for two months.

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5 As a robustness check, we generated impulse response functions from the VAR by replacing the latent QE with the shadow rates, developed by Wu and Xia (2016), as a measure of unconventional monetary policy based on a three-factor term structure model. Our results were qualitatively similar for not only the period of 2007:08 to 2013:03, but also 2007:08 to 2015:11, with the end of the second sub-sample corresponding to the month before which the Federal Funds Rate was increased (on the 16th of December, 2015) to 0.50 percent from 0.25 percent by the Federal Open Market Committee (FOMC), indicative of the formal end to the unconventional monetary policy decisions. Complete details of these results are available upon request from the authors.
References


Table 1. Important Quantitative Easing Announcements

<table>
<thead>
<tr>
<th>Date</th>
<th>Program</th>
<th>Event</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/25/2008</td>
<td>QE1</td>
<td>FOMC statement</td>
<td>LSAP initially announced</td>
</tr>
<tr>
<td>12/01/2008</td>
<td>QE1</td>
<td>Bernanke speech</td>
<td>Suggestion of extending QE to Treasuries</td>
</tr>
<tr>
<td>01/28/2009</td>
<td>QE1</td>
<td>FOMC statement</td>
<td>Fed stands ready to expand QE</td>
</tr>
<tr>
<td>03/18/2009</td>
<td>QE1</td>
<td>FOMC statement</td>
<td>LSAP expanded details about LSAP</td>
</tr>
<tr>
<td>08/12/2009</td>
<td>QE1</td>
<td>FOMC statement</td>
<td>Bernanke sees role for additional QE</td>
</tr>
<tr>
<td>08/27/2010</td>
<td>QE2</td>
<td></td>
<td>FOMC emphasizes low inflation</td>
</tr>
<tr>
<td>09/21/2010</td>
<td>QE2</td>
<td>FOMC statement</td>
<td>“additional accommodation needed”</td>
</tr>
<tr>
<td>10/12/2010</td>
<td>QE2</td>
<td>FOMC minutes</td>
<td></td>
</tr>
<tr>
<td>11/03/2010</td>
<td>QE2</td>
<td>FOMC statement</td>
<td>QE2 announced</td>
</tr>
<tr>
<td>09/21/2011</td>
<td>&quot;Twist&quot;</td>
<td>FOMC statement</td>
<td>Maturity Extension Program announced</td>
</tr>
<tr>
<td>06/20/2012</td>
<td>&quot;Twist&quot;</td>
<td>FOMC statement</td>
<td>Maturity Extension Program extended</td>
</tr>
<tr>
<td>08/22/2012</td>
<td>QE3</td>
<td>FOMC minutes</td>
<td>&quot;additional accommodation ... warranted&quot;</td>
</tr>
<tr>
<td>09/13/2012</td>
<td>QE3</td>
<td>FOMC statement</td>
<td>QE3 announced</td>
</tr>
<tr>
<td>12/12/2012</td>
<td>QE3</td>
<td>FOMC statement</td>
<td>QE3 expanded</td>
</tr>
</tbody>
</table>

Note: This Table is an exact copy of Table 1 in Tillmann (2016), derived originally from Fawley and Neely (2013).
Figure 1. Data Plots:

1(a): Growth of Industrial Production Index (IP)

1(b): QE Announcements (Shaded Area) and Latent Propensity (Latent QE)
1(c): 10-Year Treasury Constant Maturity Rate (Yield)

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1(d): Log-Returns of the S&P Emerging Markets REITs Index (EM REITs)
Figure 2. The Effect of a Shock to Latent QE

2(a): Impact on Growth of Industrial Production Index (IP)

2(b): Impact on Latent Propensity (Latent QE)
2(c): Impact on 10-Year Treasury Constant Maturity Rate (Yield)

![Graph showing the impact on 10-Year Treasury Constant Maturity Rate (Yield)]

2(d): Impact on Log-Returns of the S&P Emerging Markets REITs Index (EM REITs)

![Graph showing the impact on Log-Returns of the S&P Emerging Markets REITs Index (EM REITs)]

**Note:** UB and LB denotes upper and lower 90 percent confidence bands respectively.