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The Dynamics of U.S. REITs Returns to Uncertainty Shocks: A Proxy SVAR Approach

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Abstract

This paper investigates the impact of uncertainty shocks on REITs returns over a monthly period from 1972:01 to 2015:12, and sub-samples from 1972:01 to 2009:06, and 2009:07 to 2015:12, to accommodate for the possible effects of the Global Financial Crisis (GFC) and unconventional monetary policy decisions. We use the recently-proposed variations in the price of gold, around events associated with unexpected changes in uncertainty as an instrument to identify uncertainty shocks in a proxy Structural Vector Autoregressive (SVAR) model. Moreover, to control for news-related effects associated with these events, uncertainty and news shocks are jointly identified based on a set-identified proxy SVAR, as recently suggested in the VAR literature. Our results show that the uncertainty shock generates a larger negative impact on REITs returns over the post-GFC period to the extent that it also outweighs the impact of the otherwise dominant news (productivity) shocks. In addition, the impulse response dynamics related to the recursively identified uncertainty shock, as is standard in the literature, resembles the effects of a news shock, and somewhat contrary to intuition suggests that the impact of the uncertainty shock on REITs returns were higher during the pre-GFC era.

JEL classification: C32, E52, R33

Keywords: U.S. REITs, Proxy SVAR Model, Uncertainty, Monetary Policy Regimes

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1. Introduction

Securitized real estate markets, i.e., Real Estate Investment Trusts (REITs), have experienced tremendous growth in the United States (U.S.). According to the National Association of Real Estate Investment Trusts (NAREIT), REITs (of all types) collectively own more than 3 trillion U.S. dollars in gross real estate assets across the U.S., with stock-exchange listed REITs owning approximately 2 trillion U.S. dollars in assets. Moreover, U.S. listed REITs have an equity market capitalization of more than 1 trillion U.S. dollars. Hence, understanding the drivers of the REITs market in the U.S. is a pertinent question from the perspective of an investor. Given that the rapid decline in real estate prices, following a prolonged boom, is commonly associated as the main underlying reason for the global economic and financial crisis of 2008-2009 (Akinsomi et al., 2016), identifying the structural shocks that affect the REITs market is of paramount importance to policymakers aiming to avoid future catastrophic effects similar to those observed under the Global Financial Crisis (GFC). Thus, unsurprisingly, there exists an evergrowing literature that concentrates on analyzing the impact of macroeconomic and (primarily monetary) policy shocks on the REITs market of the U.S. (see, Chou and Chen (2014), Claus et al., (2016), Marfatia et al., (2017), Nyakabawo et al., (2018), Gupta et al., (2019a), Caraini et al., (2019), and for references cited therein for earlier studies). In general, these studies highlight the important role of not only monetary policy shocks, but also aggregate supply and financial innovations.

Interestingly, in the wake of the "Great Recession" and the GFC that followed thereafter, while a large number of studies has analyzed the impact of uncertainty shocks on the macroeconomy and the equity market of the U.S. (see, Chuliá et al., (2017) and Gupta et al., (2018, 2019b) for exhaustive reviews), the effect of such shocks on the REITs sector, despite its importance, has virtually gone uninvestigated. Against this backdrop, the objective of our paper is to analyze the impact of uncertainty shocks on REITs returns over a monthly period from 1972:01 to 2015:12, and sub-samples from 1972:01 to 2009:06, and 2009:07 to 2015:12, to accommodate for the possible effects of the GFC and unconventional monetary policy decisions. The existing empirical literature which studies the causal effect of uncertainty shocks (identified using a recursive ordering) on the economy, by employing a Vector Autoregressive (VAR) model, fails to address the simultaneity problem between uncertainty and the state of the economy (Baker and Bloom, 2013). Given this, we use the proxy structural VAR (SVAR) approach of Stock and Watson (2012) and Mertens and Ravn (2013), whereby variations in the price of gold, widely considered as a safe-haven asset (Baur and Lucey, 2010; Baur and McDermott, 2010), around events associated with unexpected changes in uncertainty, is used as an identification instrument following Piffer and Podstowski (2017). In addition, to control for news-related effects associated with the event, as suggested by Piffer and Podstowski (2017), we identify uncertainty and news shocks jointly based on a set-identified proxy SVAR, whereby the first principal component of an array of news shocks estimated in the literature is used as the corresponding proxy. No restrictions are imposed such that the proxy for the uncertainty shock is orthogonal to the news shock, however, identifying restrictions are indeed implemented to ensure that the proxy for the uncertainty shock is more correlated with the uncertainty shock than with the news shocks, and also that the proxy for the news shock is more correlated with the news shock than with the uncertainty shock. This is done to reduce for the possibility that the shocks identified as uncertainty shocks are correlated with news shocks. Finally, note that, the use of events to isolate exogenous variations in gold prices permits the model to build the identification of uncertainty shocks using high frequency data rather than on the monthly data used in the VAR, and hence allows for contemporaneous effects of both the uncertainty shock and the news shock on the REITs returns (and the other variables included in the proxy SVAR).

To the best of our knowledge, this is the first paper to use a proxy SVAR approach to analyze the impact of uncertainty shocks on the U.S. REITs market. The two papers related to our analysis are those of Ajmi et al., (2014), and Sadhwani et al., (2019), who depict the impact of (a news-based metric of economic policy) uncertainty on movements (both returns and volatility) of the U.S. REITs market. However, these two studies are based on single-equation approaches and do not make an attempt to identify uncertainty shocks in a structural fashion based on a VAR model, and hence, cannot track the dynamic impact of these shocks, but just its correlation with the real estate returns (and volatility). The remainder of this paper organised as follows: Section 2 briefly presents the methodology used by this study, with Section 3 discussing the data and the associated empirical results, and Section 4 concluding the paper.

2. Proxy SVAR Methodology

The model used in this paper is based on the one proposed by Piffer and Podstowski (2017). The reduced form model is given by:

$$y_t = c + A(L)y_{t-1} + \mu_t, \tag{1}$$

where y_t is a $k \times 1$ vector of the endogenous variables, c includes constant terms and $A(L)$ denotes the lag matrix polynomial capturing the autoregressive component of the model. The $k \times 1$ vector of reduced form shocks, μ_t, are assumed to be linearly related to the underlying structural shocks by means of the following equation:

$$\mu_t = B\epsilon_t, \tag{2}$$

where ϵ_t denotes the $k \times 1$ vector of structural shocks, whose variance-covariance matrix is normalized to the identity matrix. The aim is to identify the uncertainty shock out of the k structural shocks in ϵ_t. Let us define the scalar ϵ_t^μ as the uncertainty shock at time t, and let the $(k-1) \times 1$ vector ϵ_t^* denote all of the other structural shocks. We rewrite equation (2) as:

$$\mu_t = b^\mu \epsilon_t^\mu + B^* \epsilon_t^* \tag{3}$$

where b^μ is the impulse vector associated with the uncertainty shock, and B^* includes the impulse vectors of the remaining shocks. Note that, identifying ϵ_t^μ consists of estimating the column vector b^μ.

Let us define m_t as the proxy for the uncertainty shock. Relevance and the exogeneity conditions isolating variations in μ_t - that are driven by ϵ_t^μ rather than by ϵ_t^* - need to be imposed so that m_t can be used as a valid instrument. Furthermore, if m_t is correlated with some of the structural shocks in ϵ_t^*, then the identification of ϵ_t requires additional restrictions so as to prevent the estimated shock ϵ_t from being contaminated by the other structural shock(s) with which m_t is correlated. Note that there is no need for the proxy to be entirely free of measurement error, to be symmetric around zero, or to cover the entire time period defined by the VAR model.

The construction of the proxy for the uncertainty shock has two steps: First, Piffer and Podstowski (2017) collect an array of 38 specifically selected events that were unanticipated by market agents and are potentially unrelated to other macroeconomic shocks. Second, the authors use variations in the price of gold around these selected events in order to inform the proxy. For a detailed list and further discussion of these events, we refer the reader to Piffer and Podstowski (2017).

For the set-identification of the model, the uncertainty shock is identified by imposing that the proxy for the uncertainty shock is more correlated with the uncertainty shock than with the news shock, and identification of the news shock is derived by imposing that the proxy for the news shock is more correlated with the news shock than with the uncertainty shock. Also, Piffer and Podstowski (2017) adopt the sign convention that both an increase in the proxy for the uncertainty shock and a positive uncertainty shock imply an increase in uncertainty, as well as the sign convention that both an increase in the proxy for the news shock and a positive news shock imply the occurrence of unfavorable news. These identifying restrictions on correlations provide a minimal set of assumptions and identify the structural model in a flexible manner without imposing any direct restriction on the impulse responses. Note that, as far as the news shock is concerned, it is measured as the first principal component computed over 15 series of productivity news shocks estimated in the literature, reflecting the identification approaches by Barsky and Sims (2011), Kurmann and Otrok (2013), and Beaudry and Portier (2014).

3. Data and Results

3.1 Data

Our analysis covers the monthly period 1972:01 to 2015:12, with the start date corresponding to the availability of data on REITs, and the end date matching the end of the regime of unconventional monetary policies following the Zero Lower Bound (ZLB) of the federal funds rate. Barring the REITs data, and the monetary policy measure used, all our data on the growth of wages, employment, and industrial production, consumer price index (CPI), hours, and the S&P 100 Volatility Index (VXO) of the Chicago Board Options Exchange (CBOE) corresponds to those used by Piffer and Podstowski (2017), with the reader referred to the original paper for further details on these variables. The data is available for download from the website of Dr. Michele Piffer at: https://sites.google.com/site/michelepiffereconomics/research-1?authuser=1, with all original data obtained from the FRED database of the Federal Reserve Bank of St. Louis., excluding the VXO, which is obtained from Datastream. As far as the REITs data is concerned we use the Total Returns data on the FTSE Nareit All REITs (FNAR) index available for download from: https://www.reit.com/data-research/reit-indexes/monthly-index-values-returns.

Note that the period under consideration includes instances of conventional and unconventional monetary policy regimes. These refer to periods after which the U.S. Federal Reserve systematically cut interest rates to near zero. The ZLB hindered the Federal Reserve from further exploiting the federal funds rate to curb the adverse effects of the GFC.

Hence, The Federal Reserve implemented unconventional monetary policy tools such as Large-Scale Asset Purchases (Quantitative Easing) and Forward Guidance in an attempt to stabilise the economy. The federal funds rate was rendered useless in economic models due to the ZLB, however, the Shadow Short Rate (SSR) is not constrained by the limit of the ZLB and is, therefore, able to capture the effects of both conventional and unconventional monetary policy simultaneously. The SSR is the nominal interest rate that would prevail in the absence of its effective lower bound and is derived by modeling the term structure of the yield curve.[1] Therefore, while the ZLB may prevent the extraction of meaningful information on monetary policy in a SVAR model, the SSR allows for such inference post the GFC. The SSR in this paper corresponds to the one developed by Wu and Xia (2016), and is available for download from the website of Professor Jing Cynthia Wu at: https://sites.google.com/view/jingcynthiawu/shadow-rates?authuser=1.

As in Piffer and Podstowski (2017), the variables enter into the model in the following order REITs returns, VXO, SSR, the growth rate of wages, inflation, hours, growth rate of employment, and growth rate of the industrial production. Based on the Schwarz Information Criterion (SIC), we estimate a reduced form VAR with 3 lags. To compute (95% and 68%) confidence intervals that account for both estimation and identification uncertainty, we use 1000 bootstrap replications.

3.2 Empirical Results

In Figure 1(a) to 1(c), we present the impulse response analyses to uncertainty and news shocks for the full-sample and the two sub-samples, with the second sub-sample corresponding to the period where the ZLB was reached and the SSR became negative, i.e., covering the regime of unconventional monetary policies. The impact of the uncertainty and news shocks are qualitatively similar to those of Piffer and Podstowski (2017) for the macroeconomic variables, and hence, the reader is referred to the original paper for detailed discussion. Unlike the study of Piffer and Podstowski (2017), who did not conduct sub-sample analysis, unsurprisingly, relatively stronger effects of the uncertainty shock was observed during the post-crisis period, to the extent that it shaped the impulse responses for the whole sample, which in turn are in line with a negative aggregate demand shock representing the positive

[1] The yield curve-based framework essentially removes the effect that the option to invest in physical currency (at an interest rate of zero) has on yield curves, resulting in a hypothetical "shadow yield curve" that would exist if physical currency were not available. The process allows one to answer the question: "what policy rate would generate the observed yield curve if the policy rate could be taken negative?" The "shadow policy rate" generated in this manner, therefore, provides a measure of the monetary policy stance after the actual policy rate reaches zero.

innovation to uncertainty. Next, we turn our attention to the effect of the uncertainty and news shocks under the proxy SVAR and Cholesky identification scheme on the REITs returns, which is the main focus of our paper.

The impulse response of the All REITs returns in Figure 1(a) exhibits a strong resilience against an uncertainty shock identified within our proxy SVAR approach. The index falls only slightly on impact and exhibits a rapid recovery, subsequently overshooting and oscillating around zero before smoothing back out after 12 months. In contrast, an unfavorable news shock causes a sharp but short-lived decline in the REITs returns, indicating the fast pricing of the news. The limited response of the All REITs index to an uncertainty shock highlights the possible diversification benefits that REITs are thought to provide to market participants during periods of heightened uncertainty (Tiwari et al., forthcoming).

Next, we consider Figure 1(b) which plots the impulse response functions of the All REITs returns, along with the other variables, for the sub-sample of 1972:01 to 2009:06, i.e., essentially the pre-GFC period. The All REITs index falls by approximately 0.5% in response to an uncertainty shock and exhibits a fast recovery, with the result being in line with the full-sample. As in Figure 1(a) associated with the whole sample period, the news shock results in a sharp decline in the All REITs returns.

Finally, we turn to Figure 1(c) which plots the impulse response functions for the sub-sample period of 2009:07 to 2015:12, i.e., the post-GFC period associated with the regime of unconventional monetary policies. The All REITs returns are observed to fall by approximately 1.5% in response to an uncertainty shock, which is significantly more than under the full- and the first sub-sample, and conversely so in the case of the news shock where the effect is now more than halved. Clearly, the sub-sample analysis indicates that REITs returns are also not immune to uncertainty shocks as was thought to be the case based on the full-sample analysis in Figure 1(b) when one considers periods of heightened uncertainty.

An interesting observation is that under the recursive identification, the effect of uncertainty shock on the All REITs returns is virtually non-existent during the post-GFC period, and smaller when compared to the full- and the first sub-sample. This result is possibly due to the Cholesky decomposition-based identification approach having more in common with news shocks than with uncertainty shocks as also indicated by Piffer and Podstowski (2017).

The variance decomposition analysis presented in Figures 2(a) and 2(b), associated with the uncertainty and news shocks respectively, for the two sub-sample periods, convey the same observations as the corresponding impulse response functions. Specifically speaking, the role of the uncertainty (news) shocks in explaining the variation of the All REITs returns has increased (decreased) in the second sub-sample compared to the first one, to the extent that it even outweighs the influence of the news shock at horizon one (18.87% against 12.29%) in capturing the variability of the REITs returns. But overall the news shock is exceptionally dominant when it comes to the variance decomposition analysis, thus highlighting the importance of the aggregate supply (productivity shocks) shown to be historically important for the U.S. real estate market by Plakandaras et al., (2018), and more recently based on post World War II data by Gupta et al., (2019a).

As a robustness check, in Figures A1 to A4, we report the results for the Composite[2], All Equity[3], Equity[4] and Mortgage[5] REITs indices following an uncertainty shock, with the data again sourced from the NAREIT. In general, barring the case of the Mortgage REITs, which seems to respond positively to the uncertainty shock initially for the full-sample and the first sub-sample, our results are qualitatively similar to those under the All REITs.

4. Conclusions

In this paper, we use a proxy SVAR model to assess the impact of uncertainty shocks on U.S. REITs returns. We use a recently proposed proxy for the uncertainty shock by exploiting the variations in the price of gold around selected events. Moreover, since events potentially reflect not only variations in uncertainty but also first-moment changes related to news shocks, we study the impact of uncertainty shocks in a unified framework that identifies uncertainty and news innovations jointly. Our analysis is conducted over a monthly period of 1972:01 to 2015:12, and sub-samples of 1972:01 to 2009:06 and 2009:07 to 2015:12, with the split in the sub-samples and the end date of our analysis matching the start and end of the regime of unconventional monetary policies following the ZLB. We find that the uncertainty shock identified within the proposed proxy SVAR generates a larger negative impact of 1.5% on REITs returns over the period of unconventional monetary policy following the GFC, to the extent that it also outweighs the impact of the otherwise dominant news (productivity) shocks. Furthermore, the impulse response dynamics related to the recursively identified uncertainty shock, as is standard in the literature, more closely resembles the effects of a news shock in the proxy SVAR, and somewhat contrary to intuition suggests that the impact of the uncertainty shock on REITs returns was greater during the pre-GFC era. In sum, the

[2] The Composite REIT Index is a free-float adjusted, market capitalization-weighted index of U.S. Equity and Mortgage REITs

[3] The All Equity REITs Index is a free-float adjusted, market capitalization-weighted index of U.S. equity REITs.

[4] Equity REITs are real estate companies that own or manage income-producing properties, such as office buildings, shopping centres and apartment buildings, and lease the space to tenants.

[5] Mortgage REITs provide financing for income-producing real estate by purchasing or originating mortgages and mortgage-backed securities and earning income from the interest on these investments.

sub-sample analysis indicates that REITs returns are not immune to uncertainty shocks as was observed to be the case based on the full-sample analysis when one considers periods of heightened uncertainty. But for this to be detected, the uncertainty shock needs to be correctly identified, which might not be the case when one uses the standard recursive scheme.

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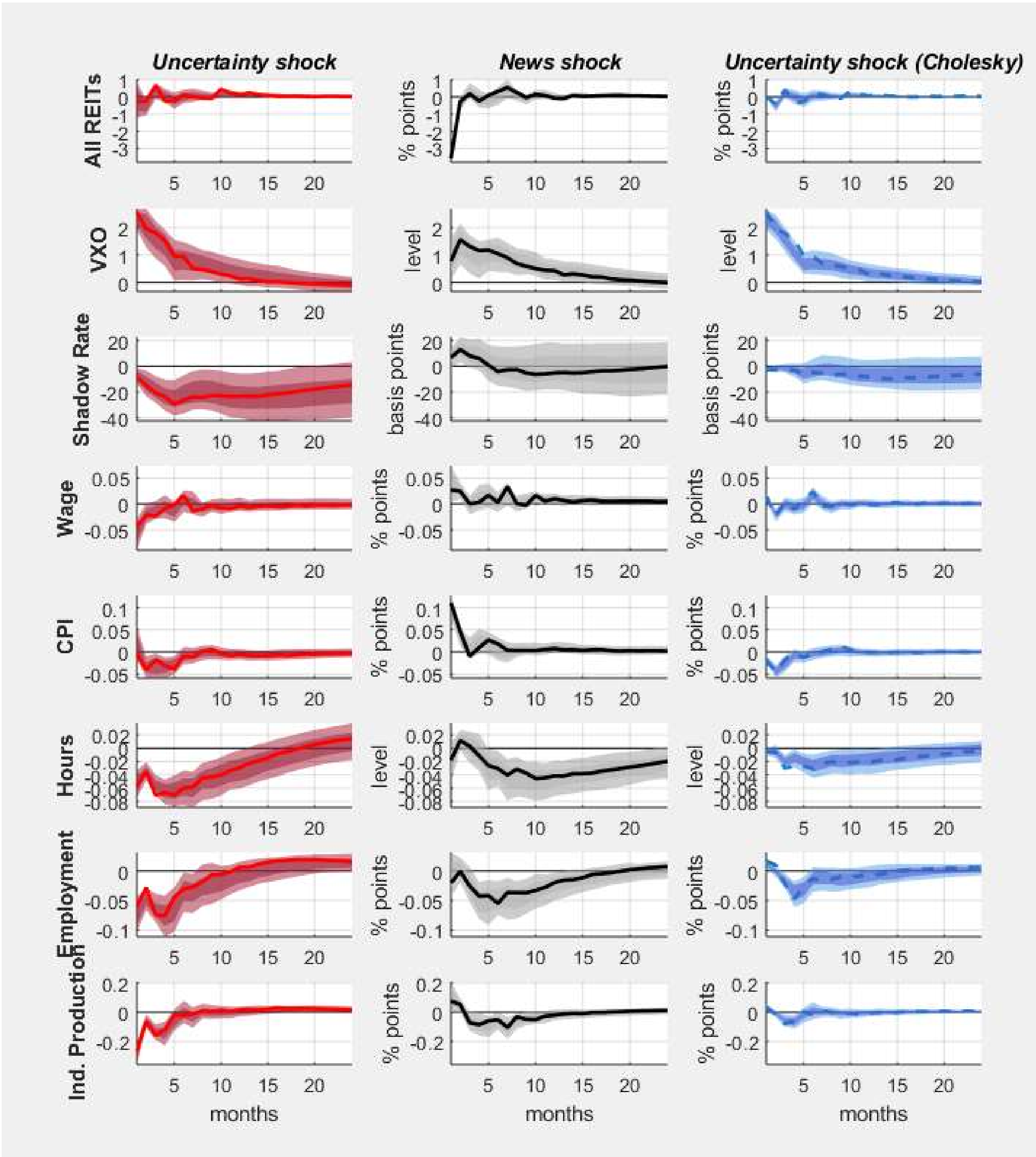
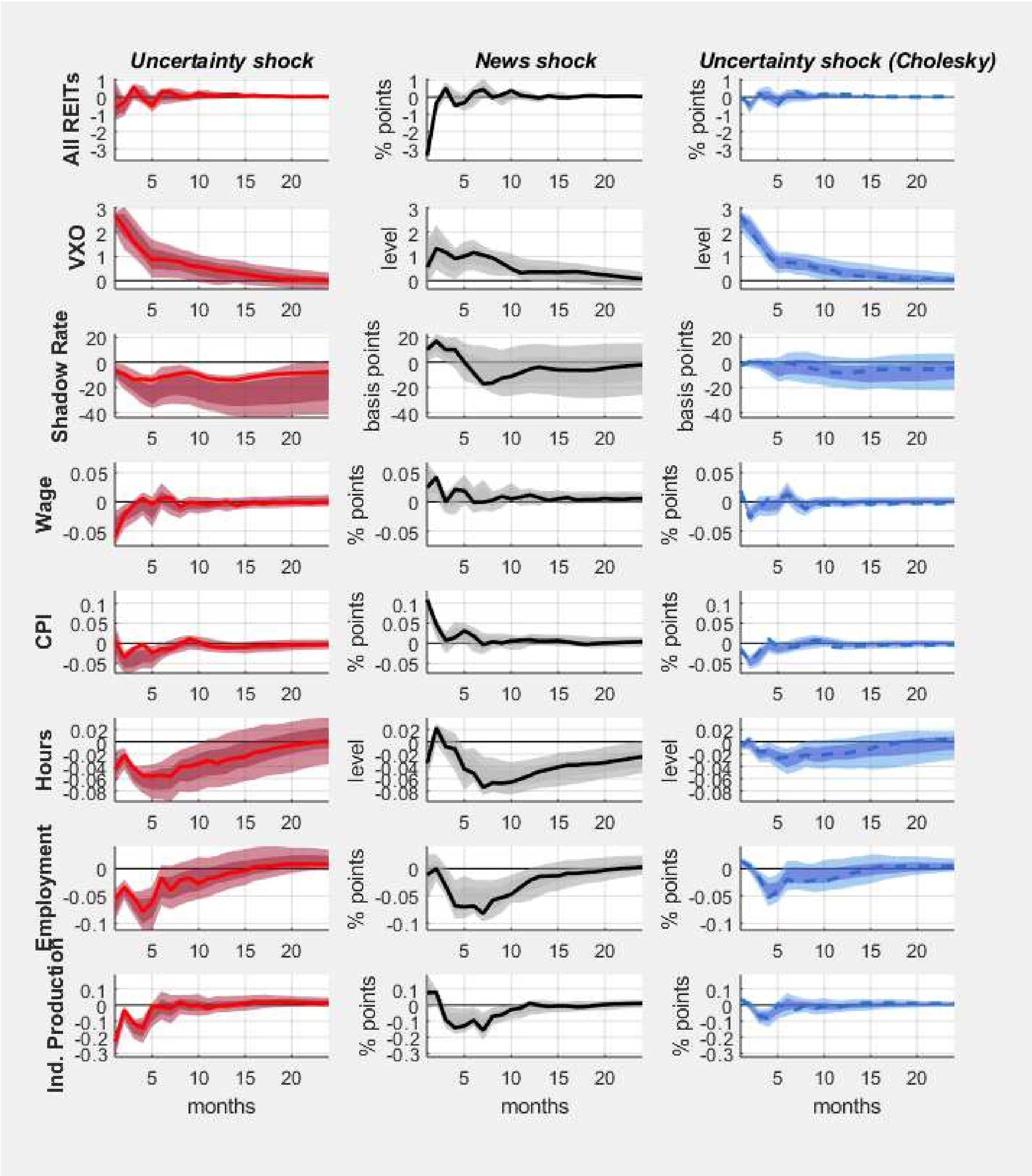
Figure 1(a). Impulse Response Functions - All REITs Index Returns (1972:01-2015:12)



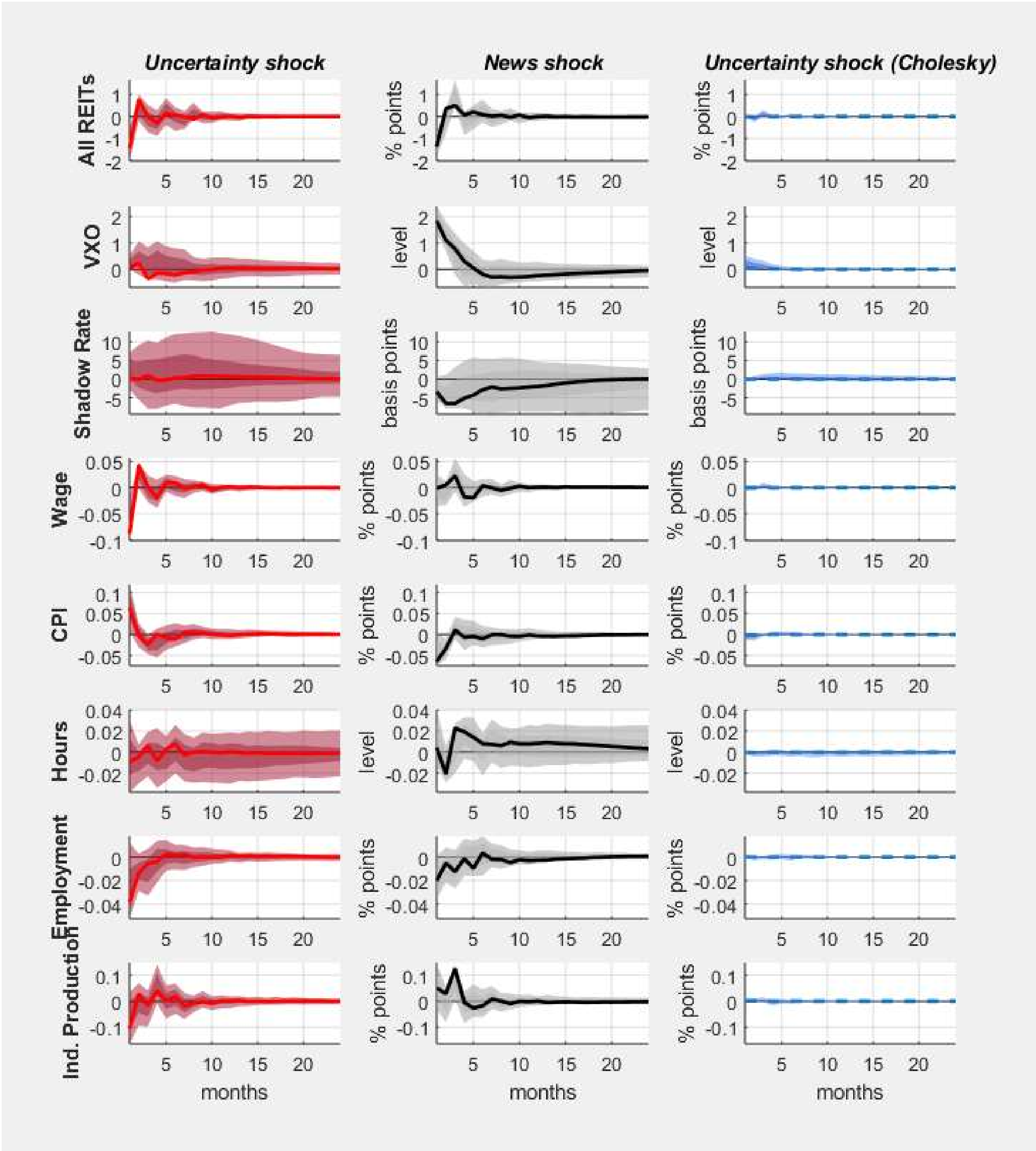
Note: Impulse response of the median target model, together with the pointwise 95% and 68% bands summarising the 1000 bootstrap replications generated. The impulse responses are non-cumulative responses and represent the responses of the variables as they enter the model.

Figure 1(b). Impulse Response Functions - All REITs Index Returns (1972:01-2009:06)



Note: See Notes to Figure 1(a).

Figure 1(c). Impulse Response Functions - All REITs Index Returns (2009:07-2015:12)



Note: See Notes to Figure 1(a).

Figure 2(a). Variance Decomposition of All REITs Index Returns due to Uncertainty Shocks

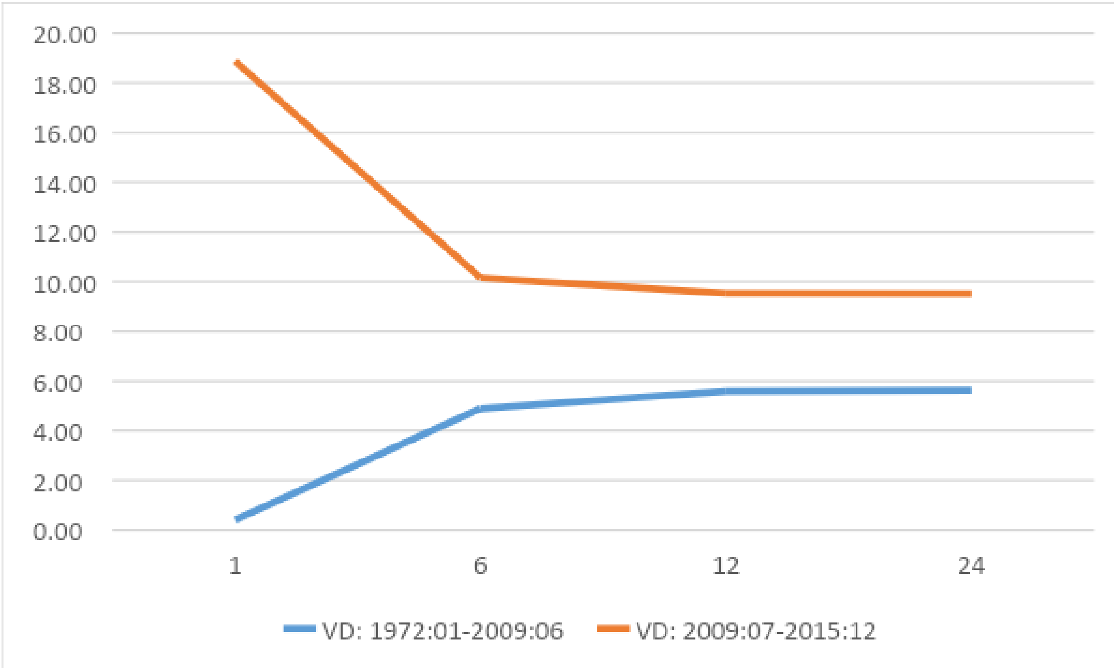
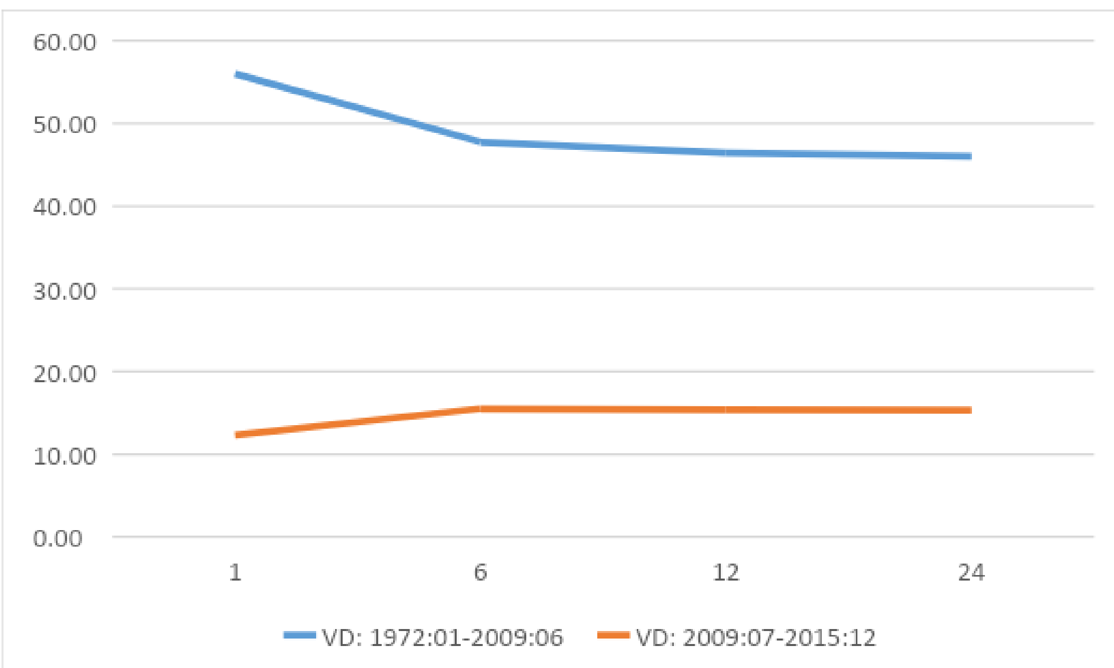


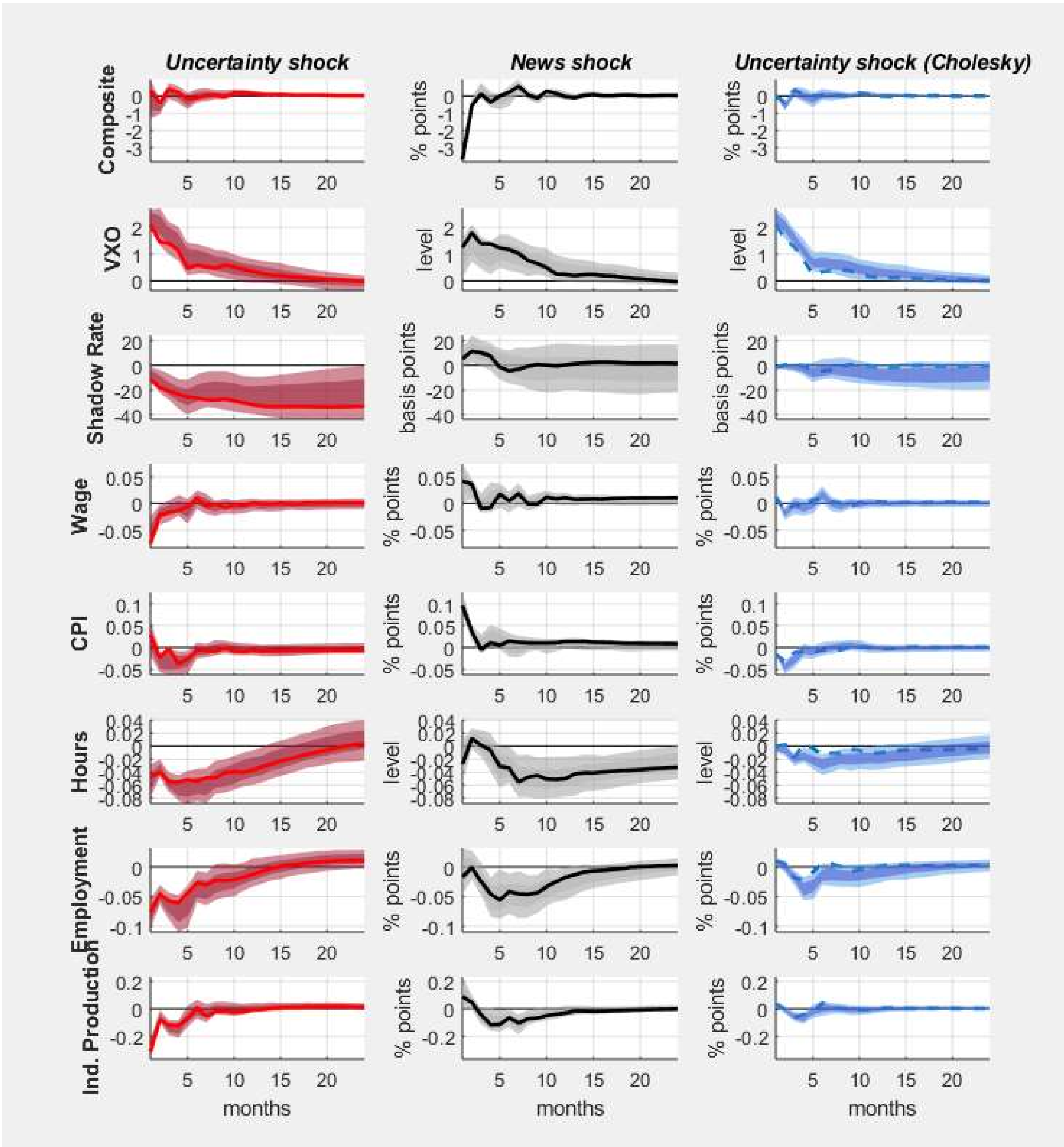
Figure 2(b). Variance Decomposition of All REITs Index Returns due to News Shocks



Note: Data represents percent of variation explained, with the horizontal axis corresponding to horizons.

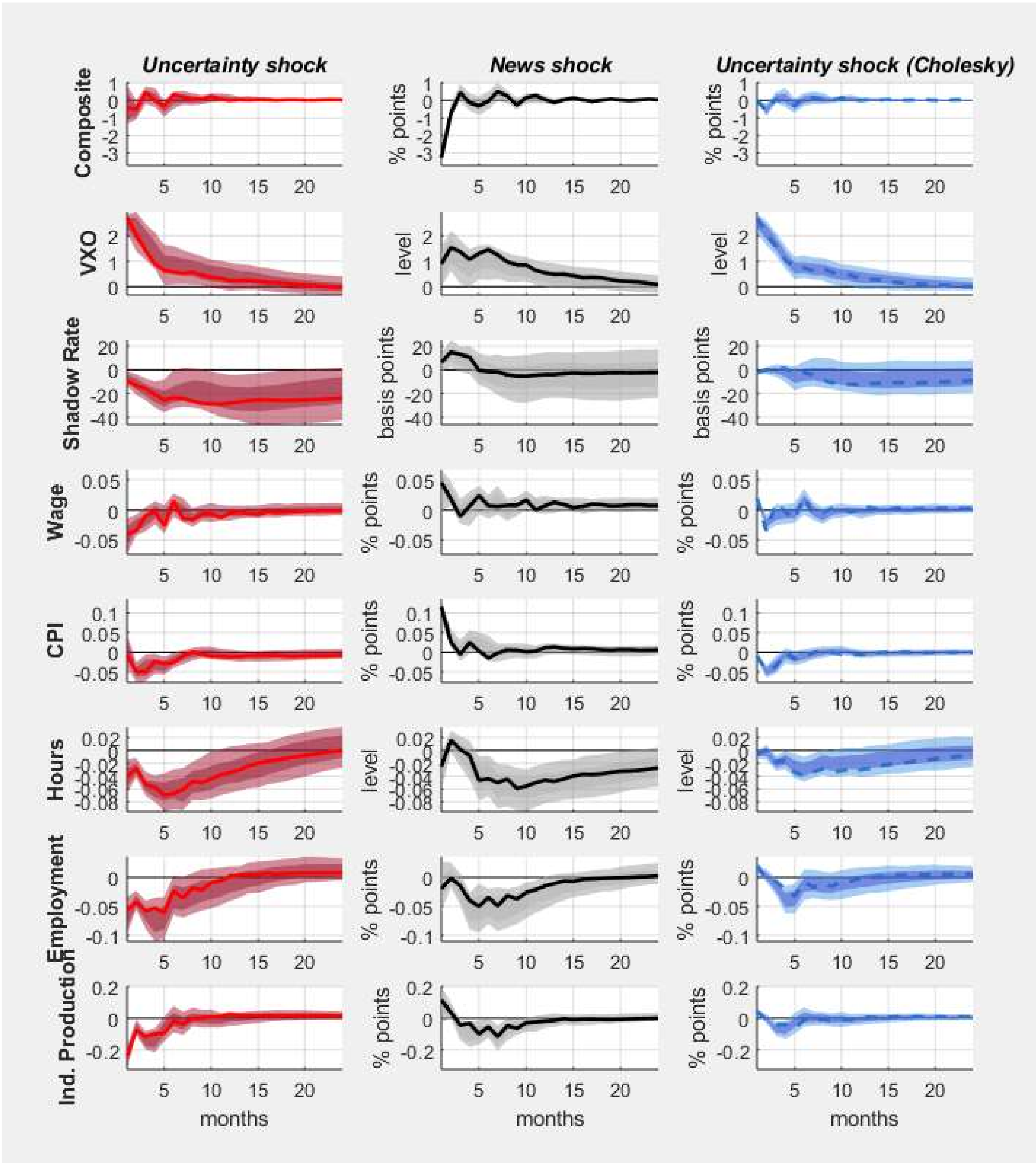
Appendix

Figure A1(a). Impulse Response Functions - Composite REITs Index Returns (1972:01-2015:12)



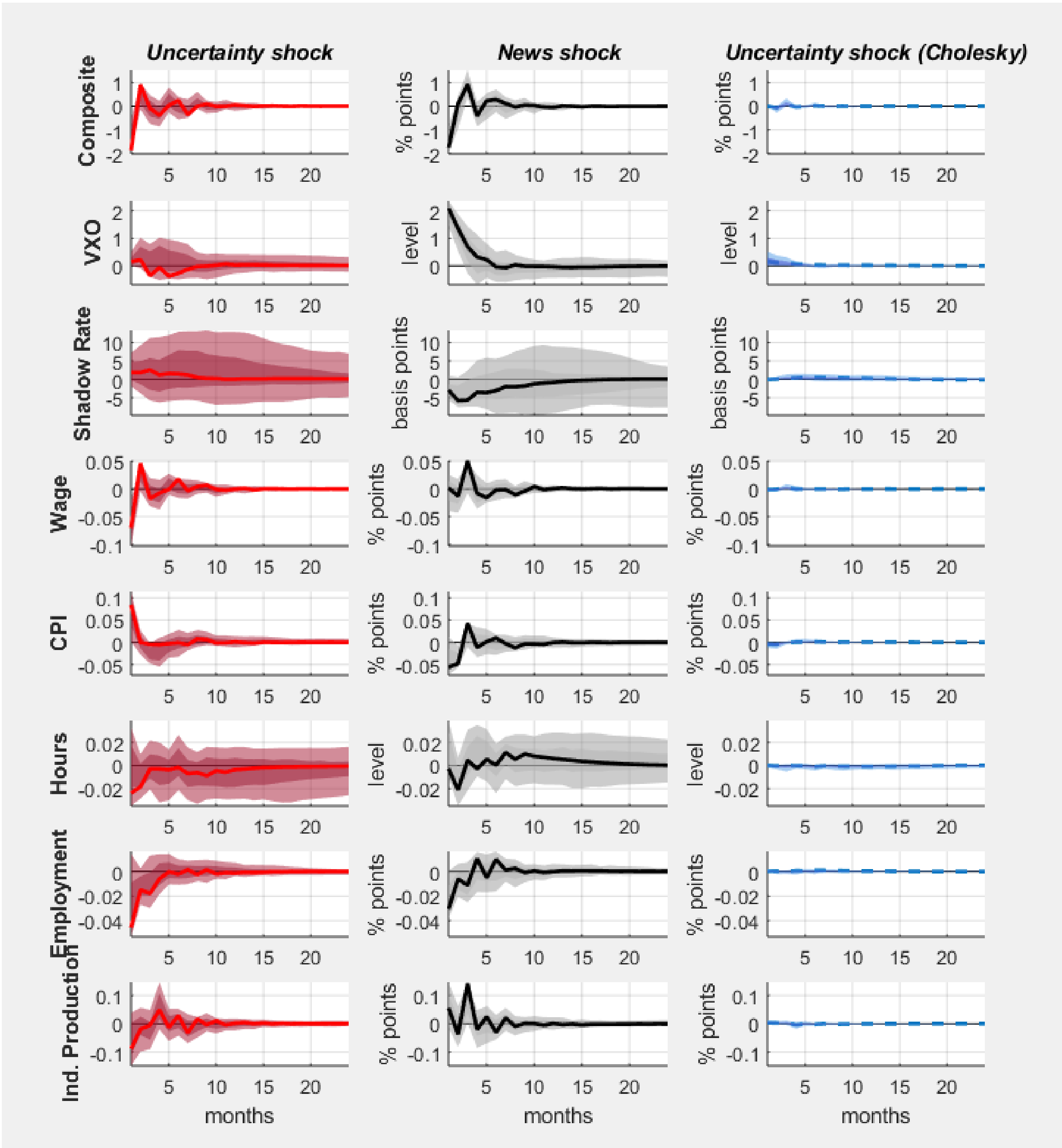
Note: See Notes to Figure 1(a).

Figure A1(b). Impulse Response Functions - Composite REITs Index Returns (1972:01-2009:06)



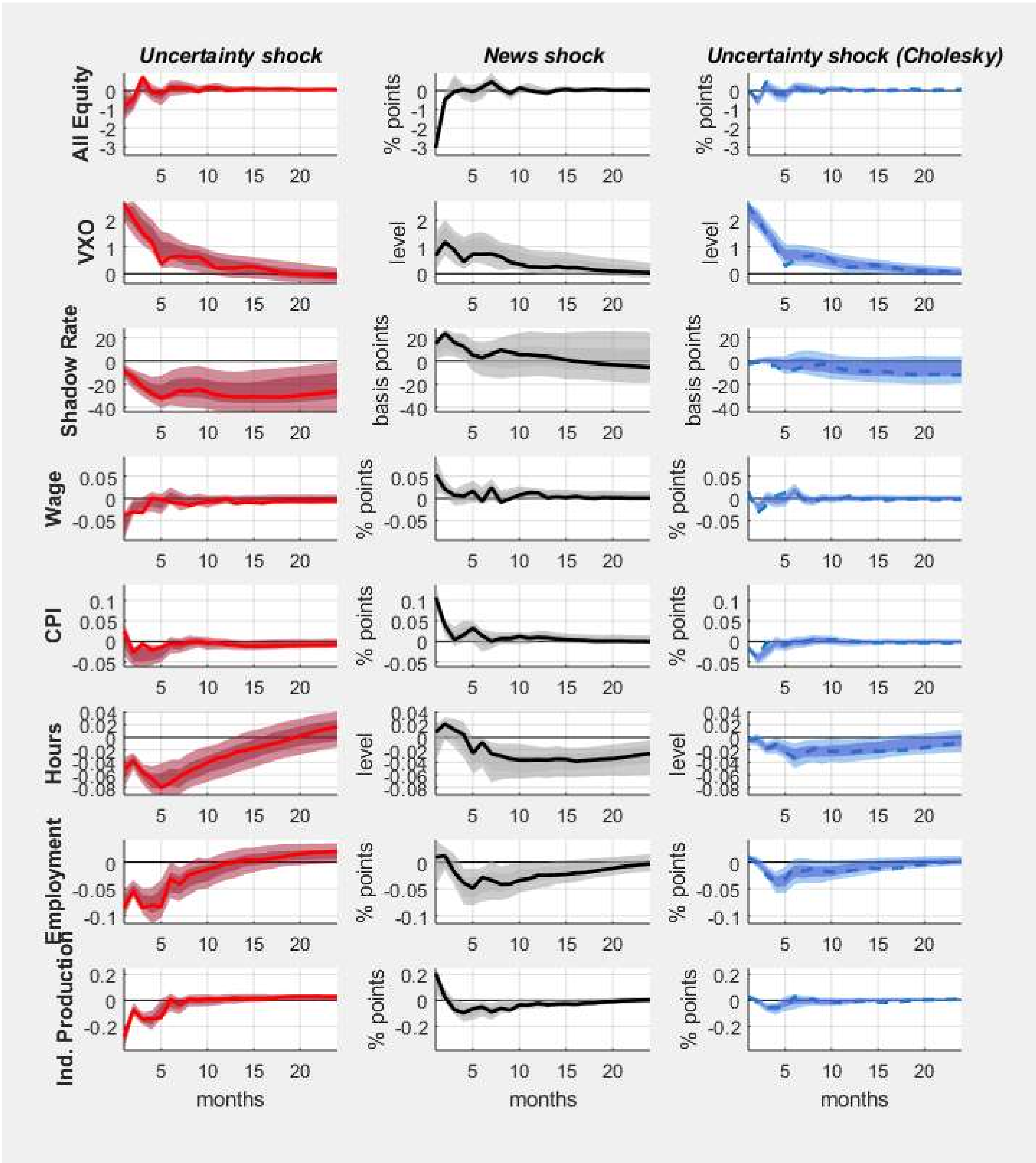
Note: See Notes to Figure 1(a).

Figure A1(c). Impulse Response Functions - Composite REITs Index Returns (2009:07-2015:12)



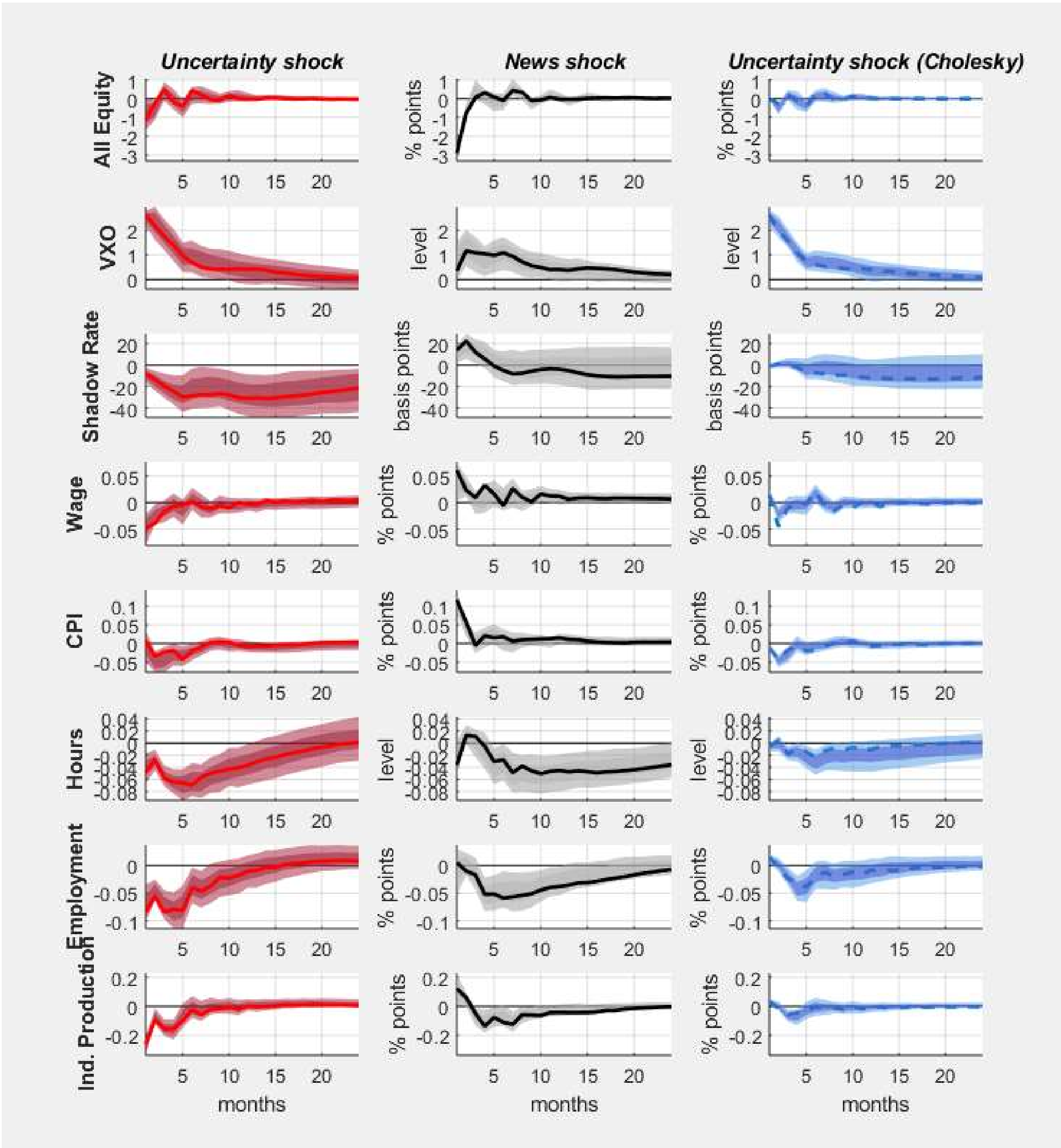
Note: See Notes to Figure 1(a).

Figure A2(a). Impulse Response Functions - All Equity REITs Index Returns (1972:01-2015:12)



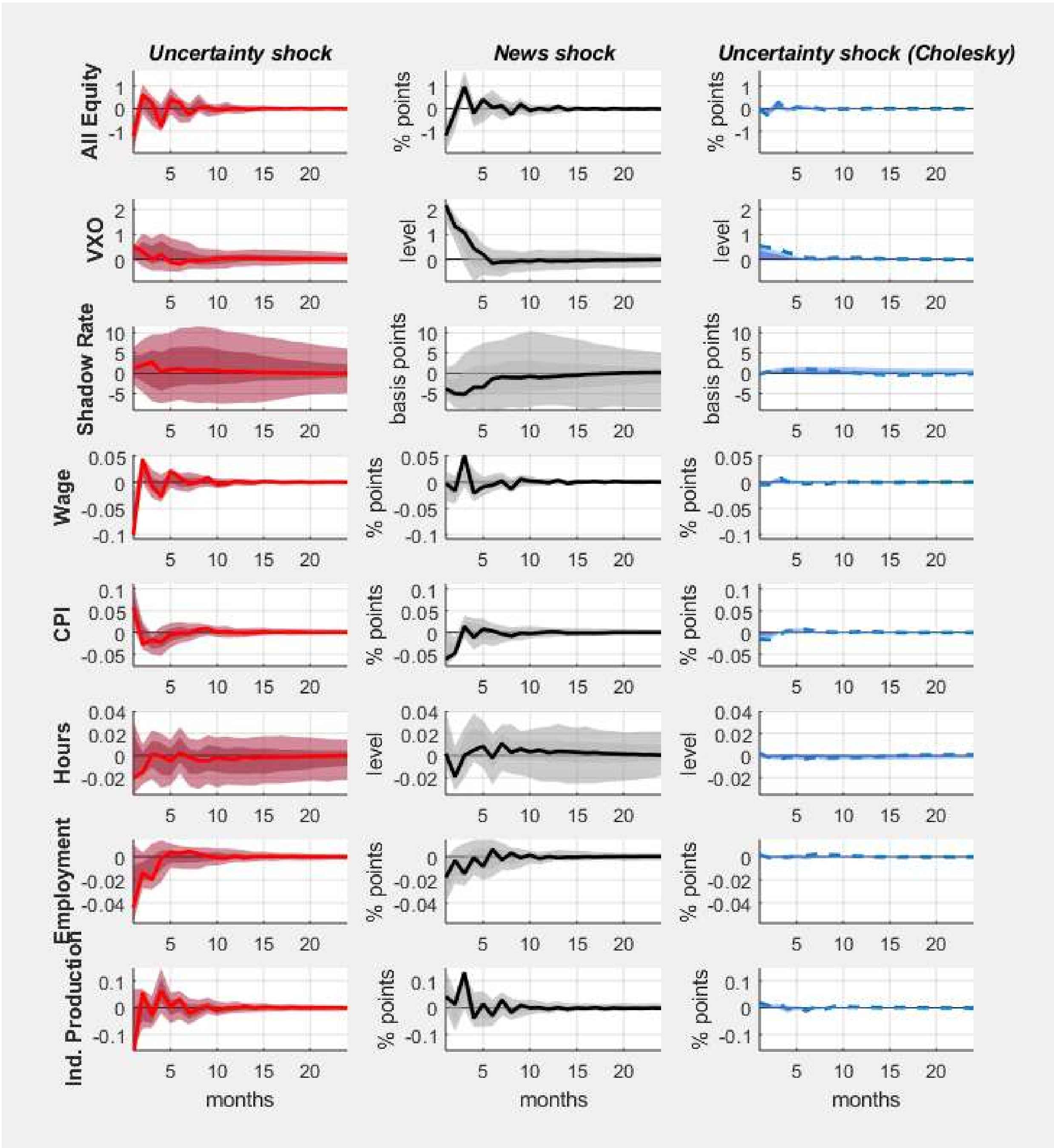
Note: See Notes to Figure 1(a).

Figure A2(b). Impulse Response Functions - All Equity REITs Index Returns (1972:01-2009:06)



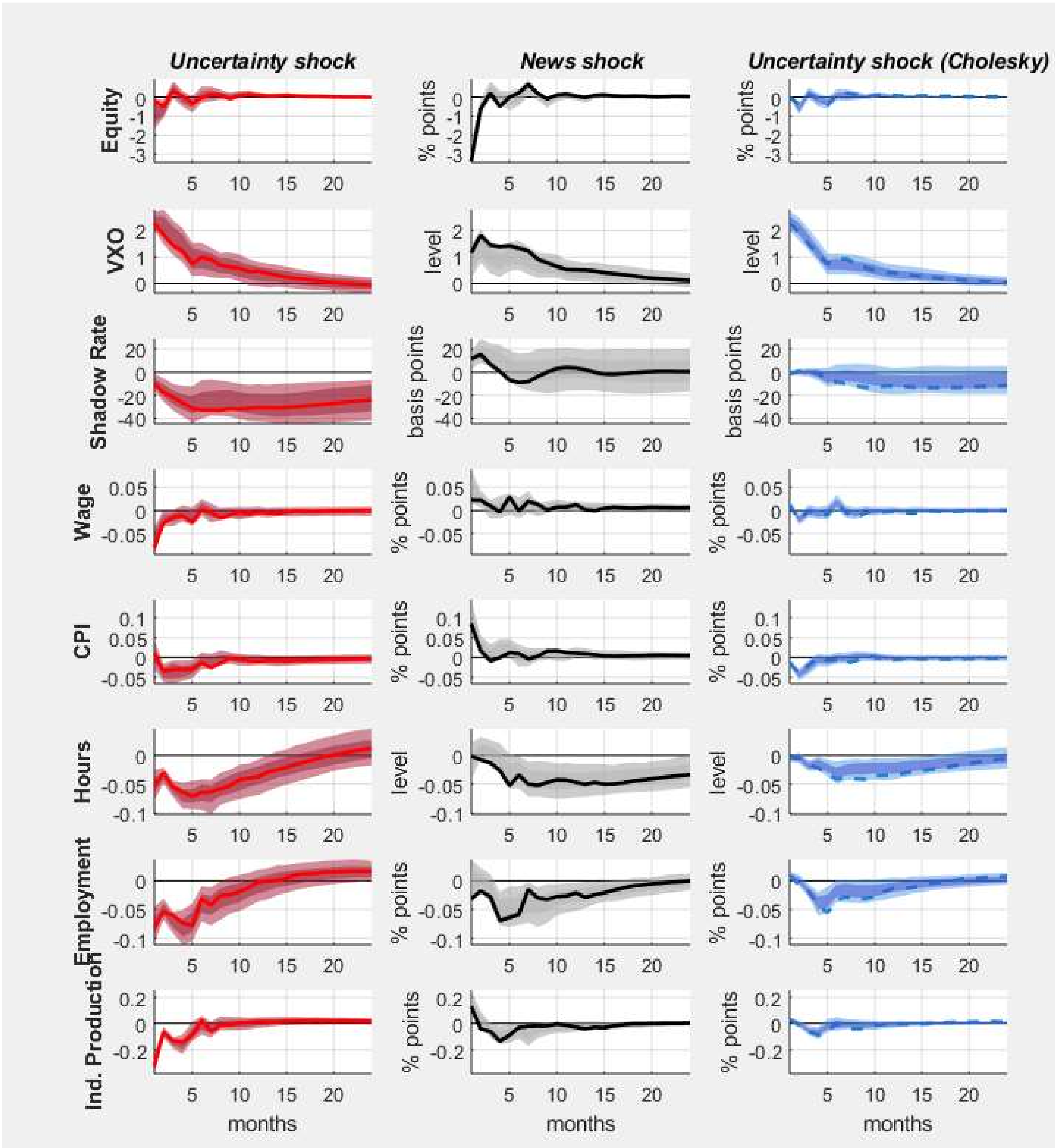
Note: See Notes to Figure 1(a).

Figure A2(c). Impulse Response Functions - ALL Equity REITs Index Returns (2009:07-2015:12)



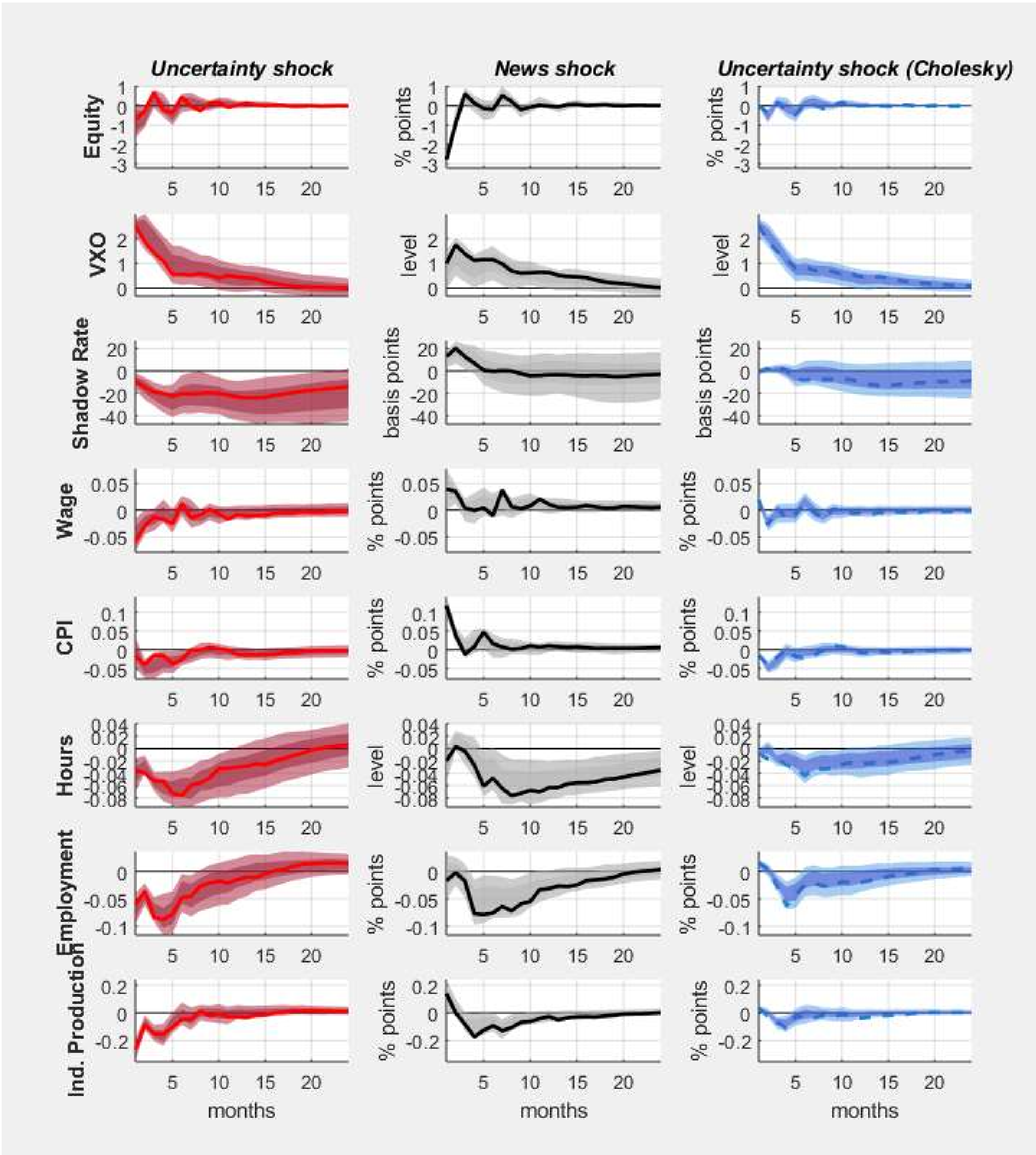
Note: See Notes to Figure 1(a).

Figure A3(a). Impulse Response Functions - Equity REITs Index Returns (1972:01-2015:12)



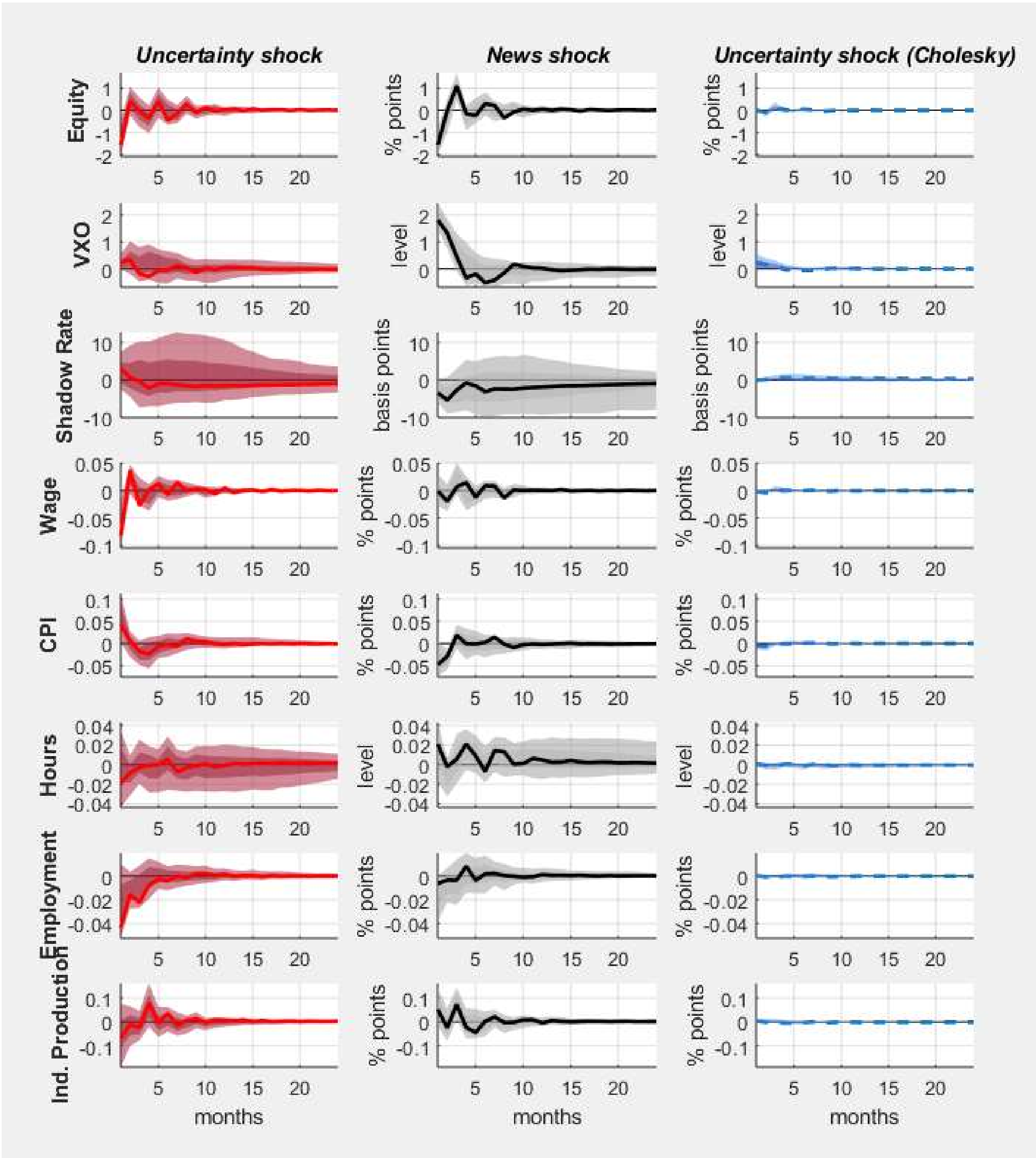
Note: See Notes to Figure 1(a).

Figure A3(b). Impulse Response Functions - Equity REITs Index Returns (1972:01-2009:06)



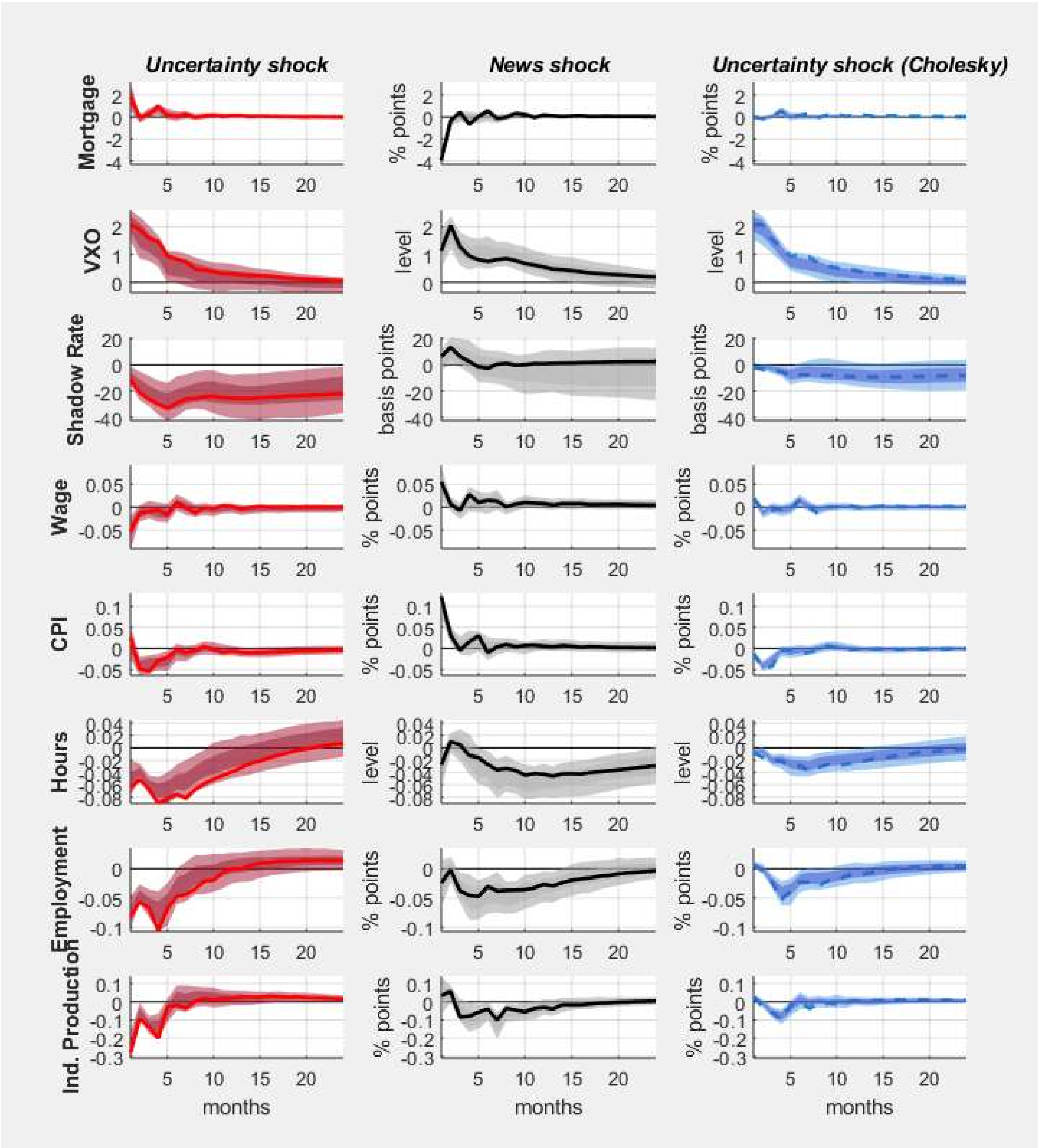
Note: See Notes to Figure 1(a).

Figure A3(c). Impulse Response Functions - Equity REITs Index Returns (2009:07-2015:12)



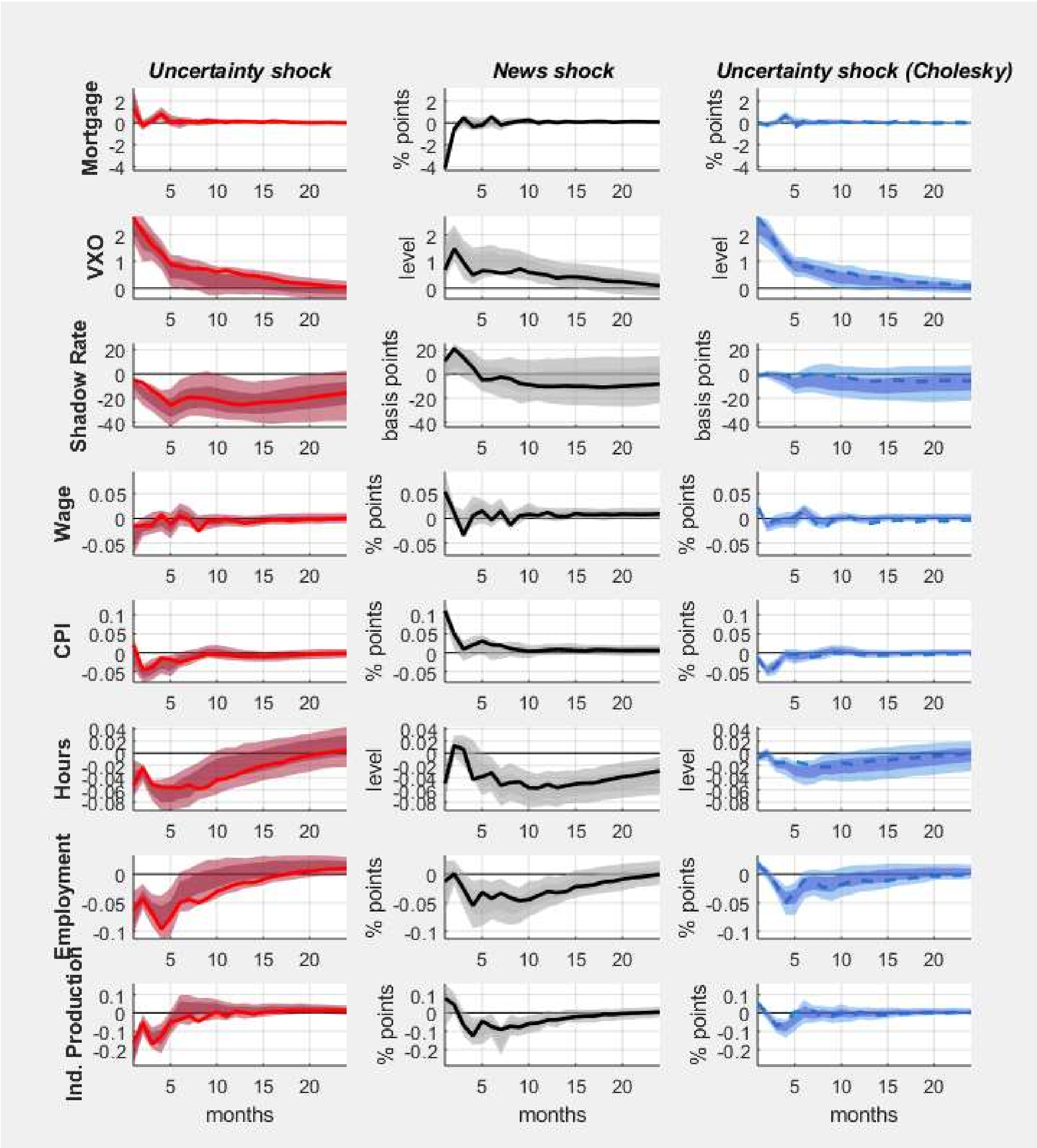
Note: See Notes to Figure 1(a).

Figure A4(a). Impulse Response Functions - Mortgage REITs Index Returns (1972:01-2015:12)



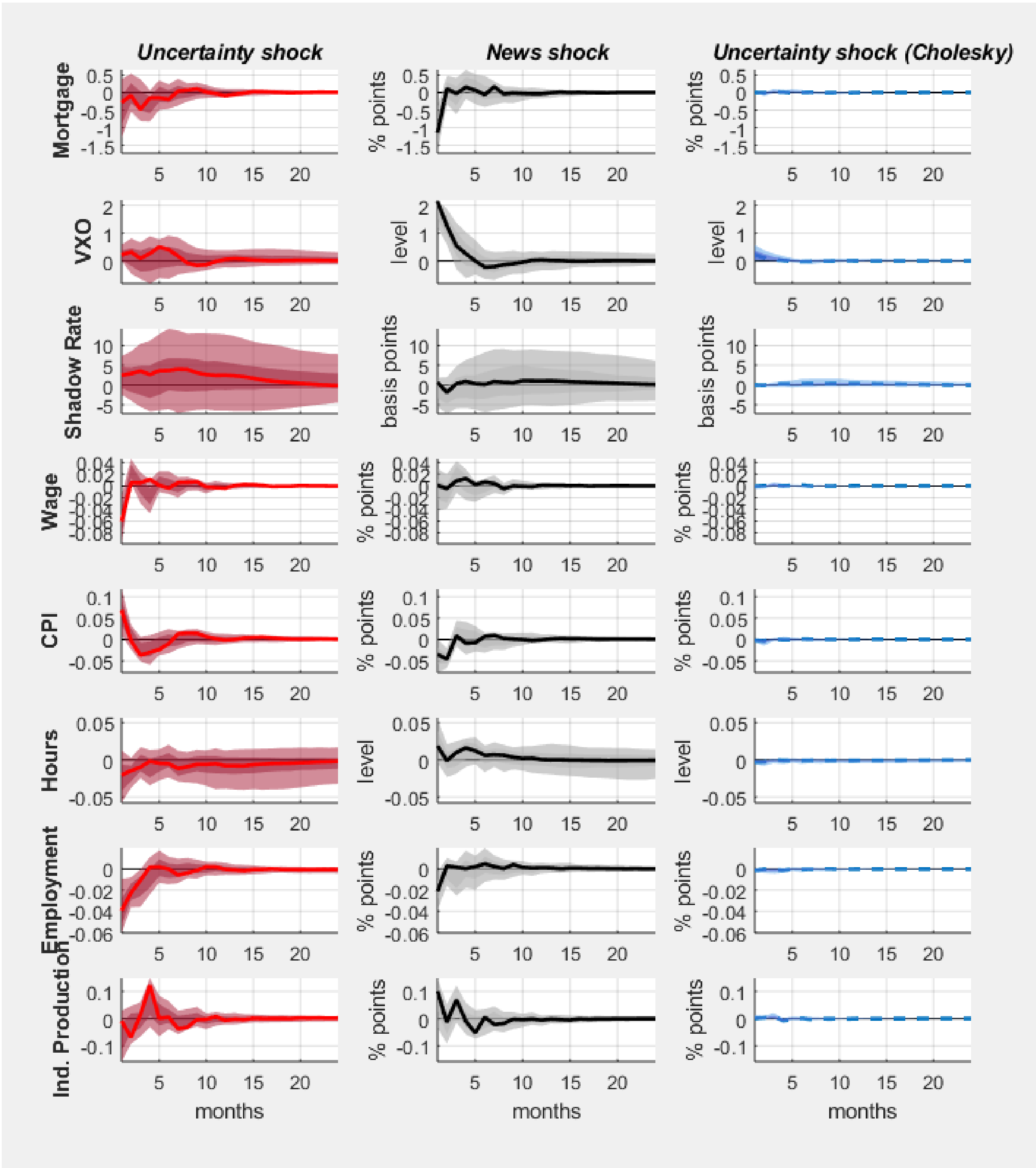
Note: See Notes to Figure 1(a).

Figure A4(b). Impulse Response Functions - Mortgage REITs Index Returns (1972:01-2009:06)



Note: See Notes to Figure 1(a).

Figure A4(c). Impulse Response Functions - Mortgage REITs Index Returns (2009:07-2015:12)



Note: See Notes to Figure 1(a).