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The Cyprus Stock Exchange as a leading indicator

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Abstract

We show that the Cyprus Stock Exchange (CSE) price index could potentially be employed as a gauge for the economy's future prospects. In particular, the CSE price index appears to have a leading indicator property with both the unemployment rate and domestic loans, something that is more visible in the post-2013 sample. This evidence, obtained using a VECM model, supports the view that despite the lack of a large liquidity in the Cyprus market, the index does reflect investors' perceptions about the economy's future. What perhaps justifies the smaller extent of the relationship prior to 2013 is that the change in lending and interest rates at the time was largely unrelated to changes in the underlying fundamentals of the economy and more associated to the state of the real estate market.

Keywords: CSE, leading indicator, unemployment rate, Cyprus

1. Introduction

Even though Europe is a bank-based financial system, it appears the stock market plays a key role in the lending decisions and allocation of resources (Krainer, 2014). That said it is only inherent that, other than purely sentiment values, the long run, equilibrium, behaviour of the stock market will depend mostly on macroeconomic factors. Dating back to Blanchard (1981), the interaction between interest rates, asset values, and output are shown to be significant.

Despite the importance of this channel, only a few studies exist that have included the Cyprus Stock Exchange (CSE) price index data in their specifications. Other than those that belong purely in the finance realm (Travlos et al., 2001; Constantinou et al., 2006; Koutmos et al., 2007; Gounopoulos et al., 2007; Andrikopoulos and Diakidis, 2007; Papathanasiou and Samitas, 2010), only Pashardes and Savva (2009) have used the CSE price index as a determinant in their real estate price model. Even then, the elasticity was found to be very small.

Similarly, in the recent studies that have offered us more insights to the workings of the Cyprus economy (inter alia, Cleanthous et al., 2019; Michail and Thucydides, 2018; 2019), no inclusion of the stock market has been made. This is despite the fact that the international literature has indicated that stock price movements can be seen as a leading indicator of changes in the economy

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(Broome and Morley, 2004), with stock markets also being positively linked to economic growth (Ake, 2010; Cooray, 2010; Durusu-Ciftci et al., 2017).

This paper fills the gap in the existing literature, by including the CSE price index in a higher frequency model (monthly frequency) than the ones previously used in the literature and argues that the reason the CSE price index has not been useful in the past were the peculiarities of the Cyprus economy. By separating our sample into pre- and post-crisis periods, we find that the impulse responses provide a much clearer picture on how the stock market affects the economy, also highlighting the fact that relationships between the variables under study have changed in the post-2013 Cyprus economy. Given this, it may take a while for a large enough sample to become available in order to run estimations at the more traditional quarterly frequency. Nonetheless, more elaboration on the potential leading qualities of the CSE may perhaps be useful.

2. Methodology

To examine the relationship between the Cyprus Stock Exchange (CSE) and the Cyprus economy, we propose the use of a Vector Error Correction Model (VECM) to account for the potential existence of an equilibrium relationship between the CSE and other variables. This will allow us to both examine for the existence of an equilibrium (i.e. long-term) relationship between the variables, as well as examine the responses of the variables to shocks that force the model estimate to deviate from its current equilibrium path. More formally, the general Vector Error Correction specification, following (Johansen and Juselius, 1990) which is defined as:

$$\Delta M_{j,t} = \alpha_j + \sum_{i=1}^{p} \beta_{1,i,j} \Delta M_{j,t-i} + \sum_{k=1}^{K-1} \sum_{i=1}^{p} \gamma_{k,i,j} \Delta \boldsymbol{W}_{t-i} + \varphi_j \boldsymbol{Z}_t + \delta_j \left(M_{t-1} - \theta_{1,j} \boldsymbol{W}_{t-1} - \theta_{0,j} \right) + \varepsilon_{j,t} \quad (1)$$

where the total number of variables is K, $M_{j,t}$ is the natural logarithm of variable j, and $\boldsymbol{W}_t$ is a $(K-1 \times N)$ matrix that contains all variables included in the estimation, other than variable j. Δ is the first difference operator, while $\beta_{i,i,j}$ and $\gamma_{k,i,j}$ refer to the own and other variable coefficient values in each of the K equations.

Again, j signifies that the coefficient refers to the equation identified with variable j, while k refers to the specific variable within matrix $\boldsymbol{W}_t$. $\boldsymbol{Z}_t$ is a matrix of the exogenous variables potentially included in the estimation, with φ_j being the equation-specific estimates of the coefficients, and $\varepsilon_{j,t}$ refers to the error processes in each equation.1 The long-run relationship between the K variables is within the brackets of equation (1) with δ_j determining the speed of adjustment to the long-run equilibrium. As usual, the δ_j term is expected to be negative in order for a return to the equilibrium to be ensured after a shock (see also Enders, 1995). In total, we employ five variables (i.e. K=5), which will form the equilibrium equation.

To provide more intuition with regards to the observed relationship, we note that the long run, as per Johansen and Juselius (1990), refers to the equilibrium relationship between the variables, i.e. one that would be reached in the absence of any external shocks. Similarly, short run refers to the fluctuations that take place and allow for deviations from the equilibrium value. As such, the terms "long run" and "short run" do not refer to any predetermined period but simply relate to

[1]In this case, no exogenous variables were included in the model.

how these relationships should be referred to, derived from theoretical models that define the long run as a period with no shocks. For more on this, see Hendry and Juselius (2000;2001).

With regards to the data employed, the CSE monthly closing prices have been employed, obtained from investing.com. To capture interest rate developments, we have used the interest rate on euro-denominated loans (outstanding amounts), house purchase up to one year (Table T10), from the Monetary and Financial Statistics publication of the Central Bank of Cyprus. Data for loans were obtained from the same publication (loans to domestic residents, Table T4). Data for the harmonized unemployment rate were obtained from Eurostat. The sample ranges from November 2007 until July 2021, due to data limitations for the loan series. Given the sample period, we have included dummy variables to capture exogenous one-off events, such as the March 2020 Covid-related lockdown, and the non-performing loan sales by banks in June 2021, June 2019 and September 2018.2

To confirm the presence of a long-run equilibrium between the variables, we first examine for the presence of a cointegrating relationship between the five variables. In other words, there needs to be an empirical justification for the use of the term in the brackets. However, before we are able to perform the Johansen test for cointegration we first need to establish that both variables are I(1), i.e. they follow a unit root process (for more details see Hendry and Juselius 2000;2001). Table 1 presents the estimates from the Augmented Dickey-Fuller and Phillips-Perron tests, which support the existence of a unit root.

TABLE 1

Unit Root Tests

	CSE	**Rates**	**Unemployment**	**Loans**
Augmented Dickey-Fuller (ADF) Test				
Level	-2.06	-2.06	-0.91	0.56
First Difference	-10.03*	-10.96*	-7.09*	-9.93*
Phillips-Perron (PP) Test				
Level	-2.06	-2.26	-0.59	0.65
First Difference	-10.03*	-12.12*	-3.76*	-9.93*

Test values for the ADF test at the 1%, 5%, and 10% levels for trend and intercept are at -3.50, -2.89, and -2.58 respectively. * denotes a rejection of the unit root null hypothesis at the 1% level.

Given that our series are I(1), as per Table 1, we can proceed with the test for the existence of a cointegrating relationship. As per the Johansen (1991) maximum eigenvalue and trace statistics, the null of no cointegration is rejected at the 1% level in both tests, while no support for the existence of any more cointegrating relationships exists. The results are available upon request. Following the Granger representation theorem (Engle and Granger, 1987), if two variables are cointegrated, then at least one variable should Granger-cause the other and, by default, they can be combined in an equilibrium relation. Hence, we can proceed with estimating the VEC model.

[2] The use of the residential property price was also considered, however, given that this only exists at a quarterly frequency, we have decided against the reduction of the sample size.

In accordance with the Akaike and Schwarz information criteria, the optimal lag length was set at two, while tests for the normality and stability of the residuals were also conducted. The variable ordering was such that the interest rate was placed first, under the usual assumption that all other variables react to monetary policy when it changes. Given the fast-moving nature of the indicator, the CSE was placed next, with the unemployment rate and loans placed last. Even though not reported (but are available upon request), robustness checks with different variable ordering, notably with placing interest rates last, were conducted with very similar results. The estimation results are presented in the following section.

3. Estimation Results

Figure 1 provides the full sample impulse responses from the full sample estimation. As the estimates imply, loan rates tend to respond positively to a shock in the unemployment rate, implying that higher risk in the economy would result in a higher pricing of lending. Similarly, a shock in loans also has a positive effect on interest rates, again under the notion that higher credit would result in offering loans to riskier borrowers (Koursaros et al., 2018; Michail, 2021).

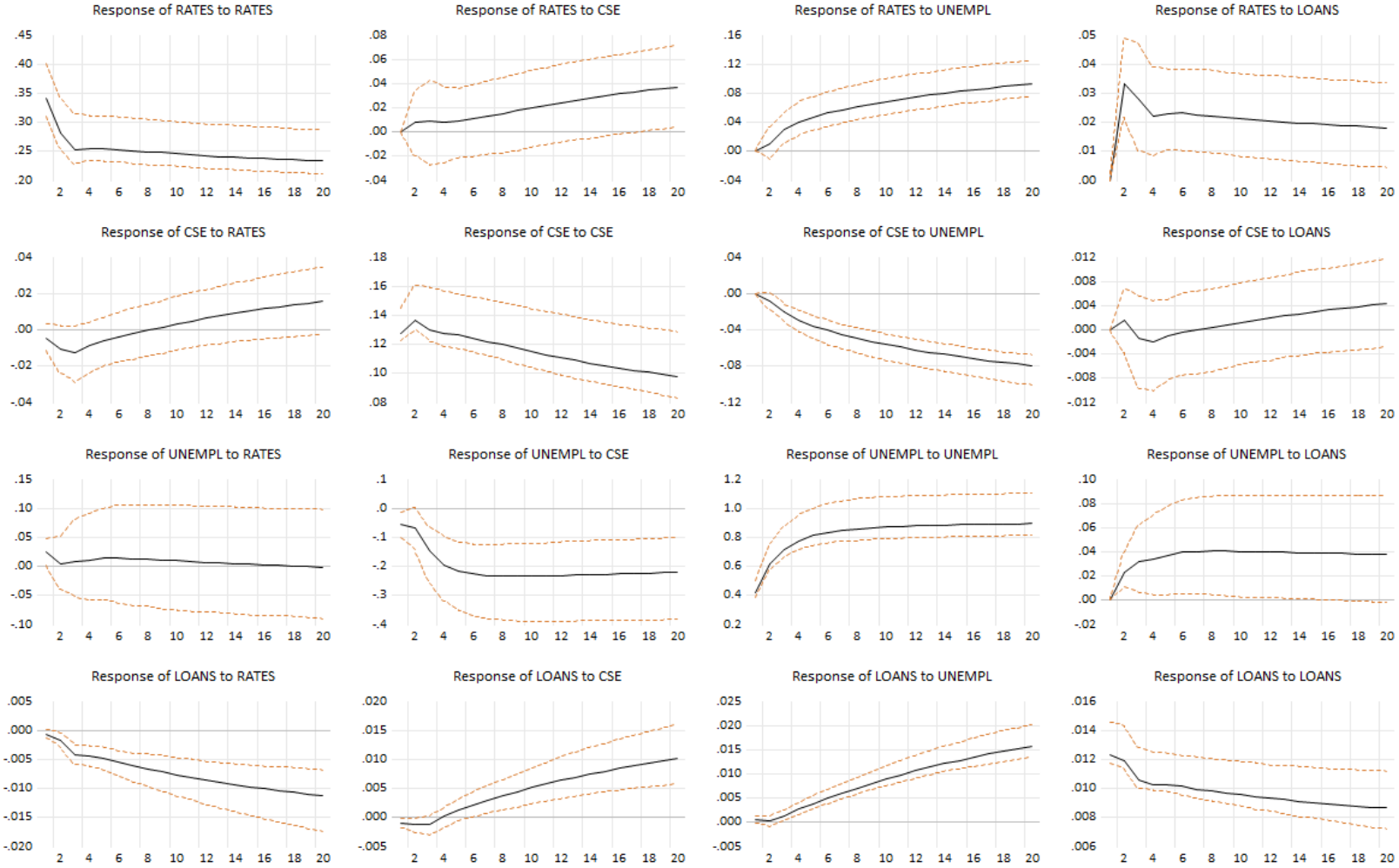
At the same time, the CSE does not respond significantly to shocks in interest rates or loans, even though a negative response is reported when a shock in the unemployment rate occurs. This suggests that macroeconomic conditions matter more for the stock market, an expected outcome given that the CSE mainly comprises of bank, retail trade, and construction-related firms. An interesting result relates to the response of unemployment to the CSE. The former tends to decline following a positive shock to the CSE, implying that the stock market can potentially act as a leading indicator for macroeconomic conditions. At the same time, the unemployment rate does not appear to react strongly to any of the monetary shocks in the full sample estimation.

Loans appear to be the series with the largest response to a shock, as they have the expected negative response to an interest rate shock, with a persistent effect stabilizing only after the 18th period. Similarly, the CSE appears to have a positive shock on loans, again highlighting the former's potential to act as a leading indicator of macroeconomic conditions. On the contrary, a rather peculiar result is that of loans to a shock in unemployment, where the former appears to increase. This unexpected result may arise from the fact that the unemployment rate's increase over the 2011-2015 period was also accompanied with an increase in lending, as a result of the increase in interest capitalization and higher non-performing loans.

The fact that there appears to be a disconnect between the pre- and post-crisis period. In this study, we use the January 2008 – December 2013 as the pre-crisis sample and the January 2014 – July 2021 as the post-crisis one. The pre-crisis estimates are reported in Figure 2. As Figure 2 suggests, the leading indicator properties of the CSE still appear to hold: following a shock to CSE, the unemployment rate registers negative response, while loans move positively albeit with a 6-month lag.

FIGURE 1

Full Sample Estimates



However, the CSE appears to have been less prone to interest and unemployment rate changes, with the first having effectively zero impact and the second affecting it to a lower extent than in the full sample. Overall, the pre-crisis sample appears to offer a more convoluted view of the overall economy, again due to the peculiarities of growth at the particular period. The interested reader may refer to Michail and Thucydides (2018) and Cleanthous et al., (2019) for more on the topic. While the estimates are not as intuitive, loans do record the expected negative response to interest rates, even though higher loans do not appear to have any significant effect on interest rates.

On the other hand, the estimates appear far more reasonable when the post-crisis sample is used. The CSE price index responds as expected, moving negatively following a shock in the unemployment rate and positively after a shock in loans. A shock in interest rates does appears to have a positive impact however this could be due to the fact that the Euribor rate has been negative over the sample period.

Similar to the overall sample properties, loan interest rates respond positively to a shock in the unemployment rate, while they also appear to response positively to a CSE shock as well as a loans shock. As we have suggested before, this abides with the literature on the topic. The unemployment rate also behaves more as dictated by economic theory, with a positive shock in interest rates raising the unemployment rate by 0.2 percentage points. The CSE appears to have a leading indicator effect on the unemployment rate with an increase in the CSE resulting in a 0.3 percentage point-decline in the unemployment rate. On the other hand, there appears to be no relationship between the unemployment rate and loans appears to hold, as the response of one to the other appears to be insignificant.

With regards to the dummy variables, the Covid-19 dummy appears to have had a strong impact on the stock market, in both the full and the post-crisis sample, a result in line with the related literature (e.g. Michail and Melas, 2020). In particular, the Covid-19 shock appears to have caused around a 0.30% decline to the CSE price index over March 2020, in addition to any impact the other macro variables may have had. Also as expected, the full sample estimates, given the large volatility observed during the pre-crisis period, especially for loans, resulted in much higher multiplier values. In contrast, in the post-crisis sample, the estimates appear far more reasonable and less volatile.

Overall, it appears that the CSE price index could potentially be employed as a gauge for the economy's future, as it appears to have a leading indicator property with regards to the unemployment rate. This relationship holds particularly in the post-crisis sample, even though the full sample properties are also promising. What appears to have masked this relationship was the state of the Cyprus economy prior to the 2013 crisis, where the increase in lending and the changes in interest rates were unrelated to changes in the underlying fundamentals of the economy. At the same time, it appears that these issues have been resolved in the post-crisis sample and hence the index can potentially offer some guidance for the future of the Cyprus economy.

FIGURE 2

Pre-Crisis Sample

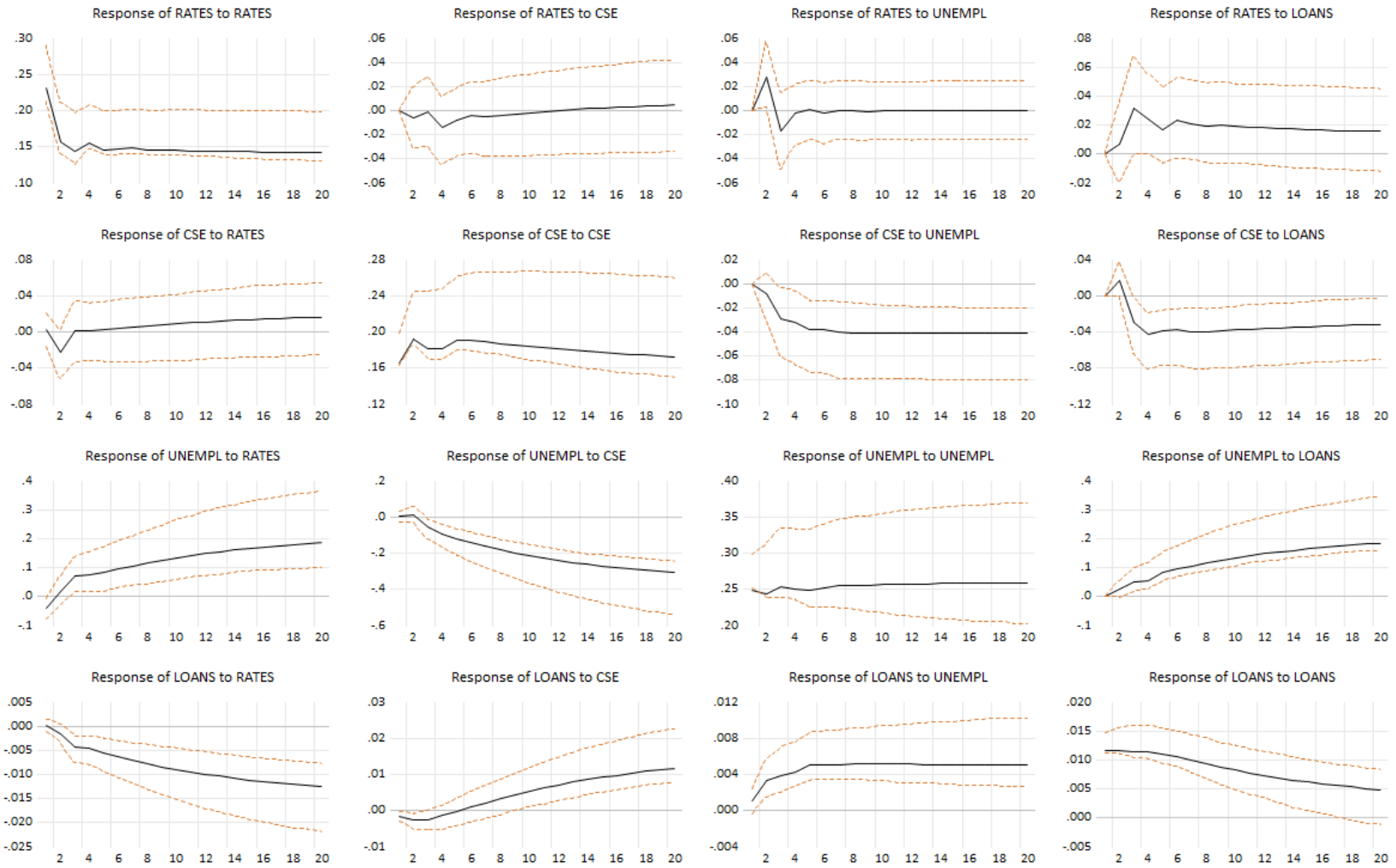
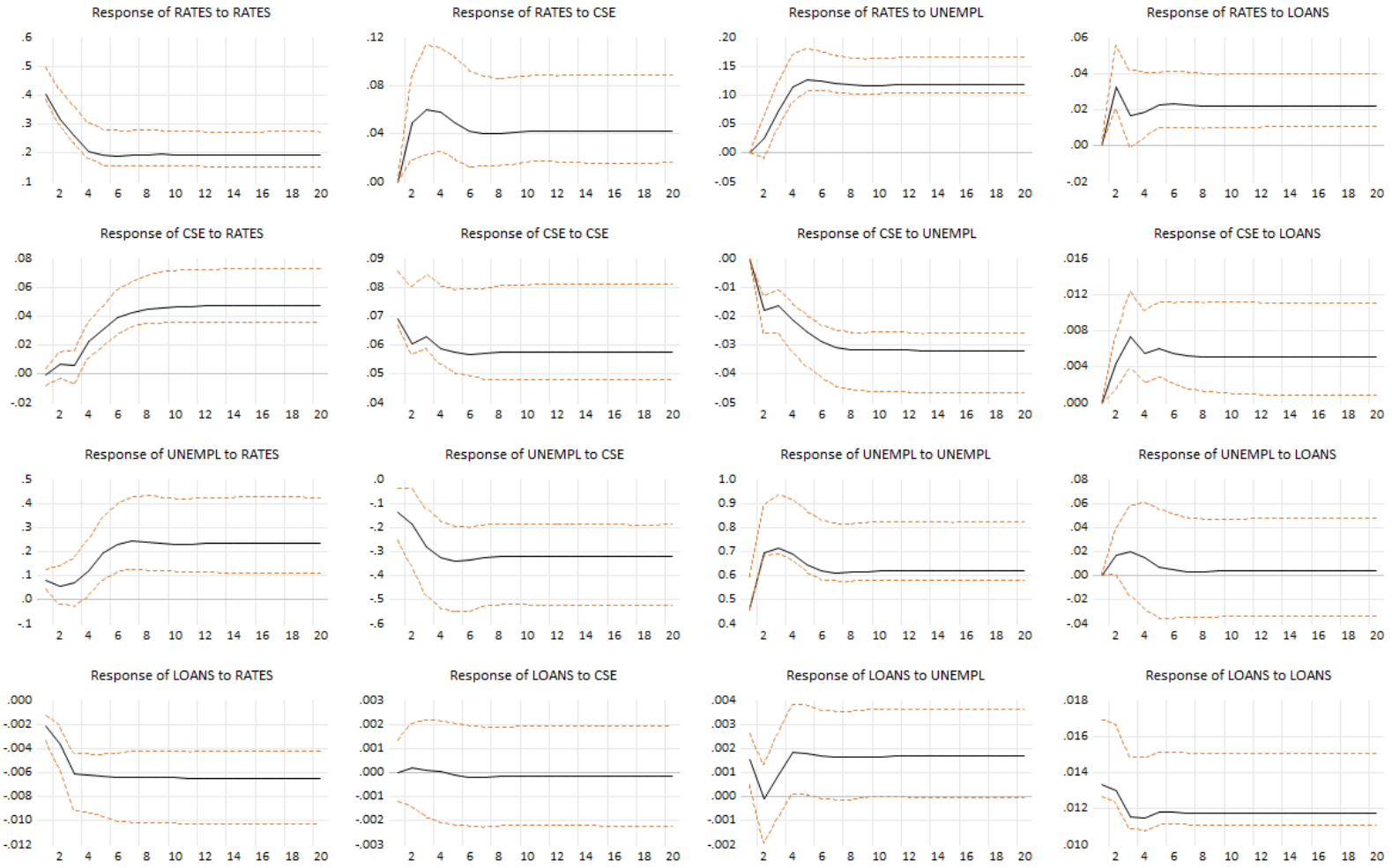


FIGURE 3

Post Crisis Sample



4. Conclusions

Despite the lack of a Cyprus-related literature, and the usual disregard with respect to the Cyprus Stock Exchange (CSE), we show that it could potentially be employed as a leading indicator, especially with regards to the unemployment rate. This is more evident in post-2013 sample. The evidence, obtained using a VECM model, supports the view that, despite the lack of a large liquidity in the Cyprus market, the index does reflect investors' perceptions about the economy's future. What perhaps justifies the smaller extent of the relationship prior to 2013 is that the change in lending and interest rates was largely unrelated to changes in the underlying fundamentals of the economy and more related to the state of the real estate market (see Savva and Michail, 2017; Michail and Thucydides, 2018; Cleanthous et al., 2019). The CSE appears to have a bi-directional relationship with the unemployment rate, with the expected negative sign, while a positive reaction of the index is observed in response to an increase in bank lending.

The post-2013 sample, in addition to demonstrating a clear leading relationship between the CSE price index and both the unemployment rate and loans, also allows for a clear demonstration of the expected relationships between other macroeconomic variables. In particular, higher interest rates are expected to have a negative effect on loans, while on the other hand, and in line with the relevant literature on the topic, higher loan volumes appear to have a positive impact on interest rates, confirming a demand-driven event. Also as expected, the unemployment rate has the usual negative relationship with interest rates. As such, while we mainly focus on the potential for the use of the CSE price index as a leading indicator, we would also like to emphasize that, following the large shock of 2013, the underlying economic relationships appear to be more in line with the experience of other countries. Naturally, more research on the topic is required to establish whether this will continue to be the case in the future.

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