

# The Predictive Power of the Term Spread on Inequality in the United Kingdom: An Empirical Analysis

Mehmet Balcilar  
Department of Economics  
Eastern Mediterranean University,  
Famagusta, via Mersin 10, Northern Cyprus, Turkey  
Email: [mehmet@mbalcilar.net](mailto:mehmet@mbalcilar.net)

Edmond Berisha\*  
Feliciano School of Business  
Montclair State University  
Montclair, NJ 07043  
Email: [berishae@mail.montclair.edu](mailto:berishae@mail.montclair.edu)

Oğuzhan Çepni  
Central Bank of the Republic of Turkey  
Anafartalar Mah. Istiklal Cad. No:10 06050  
Ankara, Turkey  
Email: [Oguzhan.Cepni@tcmb.gov.tr](mailto:Oguzhan.Cepni@tcmb.gov.tr)

Rangan Gupta  
Department of Economics  
University of Pretoria  
Pretoria, South Africa  
Email: [rangan.gupta@up.ac.za](mailto:rangan.gupta@up.ac.za)

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\* Corresponding author.

## **Abstract**

A common tool in forecasting literature used in predicting future economic conditions is the term spread, which tends to contract near peaks and rise near troughs. Building on this known relationship, this paper explores the predictive power of the yield spread on the distribution of income in the United Kingdom (UK). The results reveal that income inequality responds negatively to increases in the yield spread over the medium-term. Specifically, we show that the term spread can help to predict UK's income inequality growth both in- and out-of-sample. Our empirical findings show that it is the expected component of the term spread that has predictive power for lower income inequality in the UK.

**JEL Code:** C32; C53; E30; E43; D63; G10

**Keywords:** Yield Spread; Inequality; Term Premium; Predictions

## I. Introduction

Traditionally, the term spread, which is measured by the slope of the yield curve, has been used to assess the uncertainty over the future economic “state”. Standard asset pricing theory suggests that during the periods in which the economy is anticipated to keep growing, the term spread will be higher than in time periods in which the economy is expected to slow down (Fama and French, 1989; Estrella and Hardouveils, 1991).<sup>1</sup> Figure 1 displays the term spread for the United Kingdom (UK), the difference between 10-year government bond yield and 3-month Treasury bills, over the period 1975-Q1 to 2016-Q1 with OECD based recession indicators for the UK from the peak through the trough. The spread contracts prior to most of the economic recessions and becomes negative during the mid-recession periods. Then, we see significant upsurges in the term spread. The rationale is that when market participants feel pessimistic about future growth, they start move away from risky assets (stocks and capital investments) to less risky investments, such as long-term Treasury bonds. Note, increases in demand for long term bonds increase their price and lowers their yields leading to the flatness of yield curve (lower term spread) and decline in future economic conditions due to lower current capital investment (Bonser-Neal and Morley, 1997; Berisha, 2017). Once agents start to expect improvement in economic conditions, they will anticipate a higher inflation rate in periods of higher growth. Such expectations will contribute to higher long-term interest rates and upward-sloping yield curves.

Hence, given the information content of the term spread to predict future economic conditions, this paper explores the predictive power of the term spread on changes in income (and consumption) inequality in the UK. Since variation in the term spread signals expectations about

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<sup>1</sup> The reader is referred to Wheelock and Wohar (2009) for a detailed survey on the term spread and recessions.

future economic conditions and not all agents have the resources to take advantage of the information revealed by higher term spread, we expect, variations in anticipated economic conditions, approximated by the term spread, would lead to changes in the income distribution. We focus on the UK because income (and consumption) inequality data are available at a high frequency, i.e., quarterly basis for over 40 years (March, 1975 to March, 2016). Given that inequality is not only a problem in itself, but it also has negative economic, social, and health implications (Pierdzioch et al., 2019), the data availability of inequality at quarterly frequency is important because accurate prediction of inequality at a higher frequency should be more relevant to policymakers than at the lower annual frequency, at which measures of inequality are generally available worldwide. Besides data-based reasons, the decision to look at the UK is based on the massive inequality growth figures, with income (consumption) inequality growth between March, 1975 to March, 2016 being 13.63% (11.19%) in our data set, and hence, the UK is recognized as an outlier of extreme inequality in the European context (Dorling, 2015).

Previous literature regarding the income distribution and economic conditions is mainly concentrated around the contemporaneous relationship between income inequality and economic growth. Kuznets (1955) advocates that income inequality initially rises with economic development due to the emergence of highly productive sectors but decreases as more workers join the high-paying sectors of the economy. Barro (2000) suggests that the impact of income inequality on economic growth varies depending on the state of economic development. While income inequality in poor countries hampers economic growth, higher income inequality in rich countries encourages economic growth. Shin (2012) asserts that it is hard to claim a definitive conclusion on either a positive or negative relationship between income inequality and economic growth, and suggests that the relationship may be similar to the inverted U-shape of Kuznets.

Studies specific to the UK, such as (Redmond and Kattuman, 2001), find that higher productivity and economic growth in specific sectors contributed to higher unequal distribution of income within the UK's society. De Santis (2003) show that skill based technical changes contributed to higher wage inequalities between skilled and unskilled workers.

This paper contributes to the existing literature by shedding some lights on whether fluctuations in economic conditions, approximated by the term spread, matter for the distribution of income in the UK. Initially, generalized impulse responses are estimated to determine the sign and magnitude of the impact of the term spread on income and consumption inequality. Since the term spread is determined by the financial market's expectation of future short rates and a term premium, we also decompose the term spread into separate contributions of expected changes in short interest rates and the term premium to examine which component of the term spread dominates in driving income inequality in the UK.

In addition, we conduct the recently proposed multivariate test of time-varying causality in a VAR framework by Rossi and Wang (forthcoming), which is robust to the presence of instabilities, to examine if the predictive power of the term spread on the growth rate of income inequality measure vary over-time. We also examine the out-of-sample forecastability of the income inequality measure from the variation in the term spread. To preview, results indicate that the yield spread has strong predictive power on changes in income inequality in the UK. Particularly, increases in the yield spread correspond with subsequent lower income inequality. We find that the term spread can predict UK's income inequality growth both in- and out-of-sample and it is the expected component part of the term spread that is predicting lower income inequality in the UK. The rest of the paper proceeds as follows. Section 2 discusses the data and method. Section 3 presents empirical results and section 4 concludes.

## II. Data and the Method

### 1) Data

We use quarterly data from March (Q1), 1975 to March (Q1), 2016. The income inequality data is taken from Mumtaz and Theophilopoulou (2017). To construct income inequality measures they use income equivalized by dividing with the square root of the number of people in a household. The inequality measures are computed using survey data on income and consumption from the family expenditure survey (FES).<sup>2</sup> Mumtaz and Theophilopoulou (2017) provide an extensive documentation of the construction of the data and the survey. Note that, while the surveys are recorded at an annual frequency, Mumtaz and Theophilopoulou (2017) assign households to different quarters within a year based on the date of the survey interviews, which, in turn, allows them to calculate the measures of inequality at a quarterly frequency. Note that, these authors remove any households reporting zero or negative income, when constructing the income-based measures of inequality.<sup>3</sup> In our main analysis, we consider the Gini coefficient of income inequality.

The term spread is defined as the difference between long-term government bond yields: 10-year and 3-Month or 90-day treasury security rates for UK. Real GDP for UK is used to capture current economic conditions. Similarly, total share prices for all shares for the United Kingdom are used to calculate realized returns in the stock market. The data source for the three variables is the Main Economic Indicators database of the Organisation for Economic Co-operation and Development (OECD). All the relevant variables used in the paper are plotted in Figure 2.

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<sup>2</sup> The data is downloadable from: <https://discover.ukdataservice.ac.uk/series/?sn=200016> and <https://discover.ukdataservice.ac.uk/series/?sn=2000028>.

<sup>3</sup> We would like to thank Haroon Mumtaz for kindly sharing the inequality data.

## 2) Methods

To identify the link between the term spread and the inequality, after controlling for the performance of the financial markets and the overall economic conditions, the following 4-variable VAR( $p$ ) model is estimated:

$$Z_t = \sum_{i=1}^p \phi_i Z_{t-i} + \varepsilon_t, \quad t = 1, 2, \dots, T \quad (1)$$

where  $Z_t = [ys_t \ \Delta FI_t \ \Delta rGDP_t \ \Delta ineq_t]'$  is a vector of jointly determined dependent variables, term spread ( $ys_t$ ), financial market index ( $\Delta FI_t$ ),<sup>4</sup> real GDP ( $\Delta rGDP_t$ ), and inequality measure ( $\Delta ineq_t$ ).  $\varepsilon \sim (0, \Sigma)$  is a vector of independent and identically distributed error terms. The lag order  $p$  for equation (1) was selected using the Schwarz Information Criteria (SIC), which suggested  $p = 2$ .

Following Koop et al. (1996), we use the generalized impulse response functions. Therefore, defining the known history of the economy up to and including time  $t - 1$  by the non-decreasing information set  $\Omega_{t-1}$ , the generalized impulse function of  $Y_t$  at horizon  $n$  is defined by

$$GI_Z(n, \delta, \Omega_{t-1}) = E(Z_{t+n} | \varepsilon_t = \delta, \Omega_{t-1}) - E(Z_{t+n} | \Omega_{t-1}) \quad (2)$$

where  $\delta$  represents the shocks hitting the system at time  $t$ , and assuming  $\varepsilon_t$  has a multivariate normal distribution following Koop et al. (1996) it can be shown that

$$E(\varepsilon_t | \varepsilon_{jt} = \delta_j) = (\sigma_{1j}, \sigma_{2j}, \dots, \sigma_{mj})' \sigma_{jj}^{-1} \delta_j = \Sigma e_j \sigma_{jj}^{-1} \delta_j \quad (3)$$

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<sup>4</sup> It represents expected returns, i.e.,  $100 \times [\log(SP_{t+i}) - \log(SP_t)]$ , where  $SP$  is the share price index.

where  $e_j$  is a selection vector with 1 as its  $j$ -th element. Therefore, the  $m \times 1$  vector of the (unscaled) generalized impulse response of the effect of a shock in the  $j$ -th equation at time  $t$  on  $Z_{t+n}$  is given by

$$\left( \frac{A_n \Sigma e_j}{\sqrt{\sigma_{jj}}} \right) \left( \frac{\delta_j}{\sqrt{\sigma_{jj}}} \right), \quad n = 0, 1, 2, \dots \quad (4)$$

Letting  $\delta_j = \sqrt{\sigma_{jj}}$ , the scaled generalized impulse response function by:

$$\psi_j^g(n) = \sigma_{jj}^{-\frac{1}{2}} A_n \Sigma e_j, \quad n = 0, 1, 2, \dots, \quad (5)$$

which measures the effect of one standard error shock to the  $j$ -th equation at time  $t$  on expected values of  $Z_t$  at time  $t + n$ .

### III. Empirical Results

Figure 3 shows the generalized impulse responses of the income inequality based on the Gini measure. For ease of exposition, the impulse responses are standardized and accumulated.

We observe that a positive one standard deviation shock to term spread has statistically significant negative effects on income inequality. Particularly, per one standard deviation increase in yield spread income inequality decreases by 0.2 standard deviation. The point estimate remains statistically significant over the five-quarters. The findings reveal that after an increase in the term spread, we should anticipate lower income inequality up to five quarters. It should be noted that steepness of the yield curve mainly occurs after the economy enters a recession. Thus, from our results, we can claim that as the severity of the economic downturns lessens over the medium term, we should expect a contraction of inequality in income in the UK.



As a robustness check, we replace the Gini coefficient of income inequality with the corresponding Gini coefficient for consumption inequality in our VAR model, and reconducted our analysis. The Gini coefficient for consumption inequality is also sourced from Mumtaz and Theophilopoulou (2017), and is constructed based on consumption equalized by dividing with the square root of the number of people in a household. As can be seen from Figure 4, the results are qualitatively and quantitatively similar to those of the Gini coefficient of income inequality. Given this, for the rest of the paper, we will continue to focus on the Gini coefficient of income inequality only while conducting our additional analyses, as the results (complete details of which are available upon request from the authors) continue to be similar.

In this regard, to corroborate further the predictive ability of the term spread on the growth of income inequality, as observed from Figure 3, we continue the analysis by examining time-varying predictability of the term spread on the growth rate of income inequality measure. Particularly, we conduct the recently proposed multivariate test of time-varying causality in a VAR framework by Rossi and Wang (forthcoming), which is robust to the presence of instabilities.<sup>5</sup> As can be seen from Figure 5, based on a time-varying parameter (TVP) VAR model of order 2, the null that the term spread does not Granger cause the growth in the Gini coefficient of income inequality is consistently rejected over the entire data sample,<sup>6</sup> with strong rejections observed towards the beginning and end points of the sample period.<sup>7</sup>

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<sup>5</sup> The Stata code used for the analysis is available for download on the website of Barbara Rossi at <https://sites.google.com/site/barbararossiwebsite/Barbara-Rossi-research>.

<sup>6</sup> This result basically confirms the full-sample Granger causality test statistics under instability (as proposed earlier by Rossi (2005)) namely exponential Wald (*ExpW*), Mean Wald (*MeanW*), Nyblom (*Nyblom*), and Quandt Likelihood Ratio (*SupLR*) tests with all of them having *p*-values of zero given their test statistic values of 376.77, 281.28, 11.33, and 762.99, respectively, suggesting that the yield spread does indeed cause the growth of the Gini coefficient for income inequality at all *t*.

<sup>7</sup> We also used the bootstrapped recursive, rolling, and recursive-rolling tests of Shi et al. (2018, forthcoming) to check for time-varying causality from yield spread to the growth of the Gini coefficient of income inequality. The MATLAB codes are available for download from the website of Professor Shi at

Since in-sample predictability, does not guarantee out-of-sample forecastability, in addition, we estimated various (Bayesian) constant and time-varying parameters VAR and vector autoregressive moving average (VARMA) models, with and without stochastic volatility as proposed by Chan and Eisenstat (2017).<sup>8</sup> As reported in Table 1, based on an initial in-sample period of 40 quarters, the relative (to the random walk model) log predictive likelihoods at horizons of 1-, 2-, and 3-quarter-ahead, again confirms the ability of the term spread to forecast the density of the growth of the Gini coefficient of income inequality over a recursively-estimated out-of-sample period. In other words, the term spread can predict UK's income inequality growth both in- and out-of-sample.

Finally, realizing that, the term spread is determined by the financial market's expectation of future short rates and a term premium, we decompose the term spread into separate contributions of expected changes in short interest rates and the term premium to examine which component of the term spread dominates in driving income inequality in the UK. An identity relation exists between the long-term forward rate and the sum of current and expected short-term rates plus a time-varying term premium, i.e.,  $i_t^n = \frac{1}{n} E_t \sum_{j=0}^{n-1} i_{t+j} + tp_{t,n}$ , where  $i_t^n$  is the (n-quarters-ahead) 10-year rate in quarter  $t$ ,  $i_{t+j}$  is the three-months, i.e., 1-quarter short rate in quarter  $t + j$  ( $j = 0, 1, \dots, n - 1$ ) and  $tp_{t,n}$  is the term premium on a 10-year bond with respect to the 1-quarter bond in quarter  $t$ . Therefore, the expectation of the short-term rate is the key element for the identification of the term premium.

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<https://sites.google.com/site/shupingshi/home/codes?authuser=1>. Based on an initial window of 40 quarters and 500 bootstrap replications, as can be seen from Figure A1, we find evidence of causality only (at the 5% level of significance) around the late 1980s, primarily under the recursive scheme. In other words, evidence based on the tests of Shi et al. (2018, forthcoming) is weak (with causality mainly observed at the 10% level of significance). Given that window-based tests lead to loss of observations, and is generally sensitive to the size of the window, we would like to rely more on the full-fledged time-varying test of Rossi and Wang (forthcoming) for our inferences.

<sup>8</sup> The MATLAB codes used for conducting the out-of-sample forecasting analysis is available from the website of Joshua Chan at [http://joshuachan.org/code/code\\_TVPVARMA.html](http://joshuachan.org/code/code_TVPVARMA.html).

Following, Gil-Alana and Moreno (2012), we fit an ARFIMA (1,  $d$ , 0) model to the 3-month Treasury yield and use the identity above to determine the term-premium.<sup>9</sup> The fractional integration framework allows us to determine the order of integration of a given variable without the restriction of having to choose a priori between zero (stationary) and one (unit root).

From Figure 6(a) we observe that increases in expected term spread lead to lower income inequality. Particularly, per 1 standard deviation increase in expected term spread, income inequality decreases by approximately 0.3 standard deviation. The point estimates of income inequality remain negative and significant for ten-quarters period. Findings from Figure 6(b) show that the term premium has a statistically insignificant impact on income inequality. Results indicate that it is the expected component part of the term spread that is predicting lower income inequality in the UK, and it has a relatively stronger impact when compared to the overall term spread.

In summary, the results document that subsequent improvements in economic conditions, as captured by increases in the term spread, are associated with lower levels of income inequality over the medium-term. Noting that, one factor that links the term spread with improvements in economic conditions is monetary policy. As the Bank of England conducts expansionary monetary policy, short-term rates decrease more than long term rates leading to an upward-sloping yield curve. Given that the expansions of monetary policy are followed with growth in output, the upward sloping yield curve will correspond with subsequent economic expansion. Thus, monetary policy might be one contributing factor in linking the term spread with income and consumption inequality. The findings suggest that expansionary monetary policy is expected to lower inequalities on income (and consumption) over the medium-term. Findings are in close

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<sup>9</sup> The estimate of the long-memory parameter  $d$  was found to be 0.705, which was significantly different from zero at the 1% level of significance. This implied that the short rate is not covariance stationary, but is still mean-reverting, and hence the effect of shocks on it will die away eventually in the long-run. Note complete details on the estimation of the ARFIMA model is available upon request from the authors.

correspondence with the results shown by Mumtaz and Theophilopoulou (2017), where they document that contractionary monetary policy shocks lead to an increase in inequalities in consumption and income. Another contributing factor that can explain the relationship between the term spread with (consumption and) income inequality is the expected inflation. As agents start to anticipate higher economic growth, they will expect higher inflation in periods of high growth. Such expectations are likely to lead to higher long-term rates and an upward-sloping yield curve. Therefore, the negative association between the term spread with income and consumption inequalities indicate that low inflation rate reinforces inequalities in income and consumption in the UK. Findings further contribute to the recent literature where it is documented that low inflation rates are associated with higher income inequality across developed economies. Monnin (2014) shows that low inflation rates are associated with higher income inequality. Faber and Fally (2017) claim that richer gain more from the price declines brought on from trade, making the consumer benefits from international trade less progressive.

#### **IV. Conclusion**

The yield spread serves as a predictor for future economic conditions. It tends to shrink prior to an economic slowdown and increase as the economy is expected to grow. Thus, given the rich economic informational content of the yield spread, this paper explores the predictive power of the yield spread on the distribution of income in the UK.

The results reveal that income inequality is negatively related to increases in the yield spread over the medium-term. As observed in the data for the UK, steepness of the yield curve mainly occurs after the economy officially enters a recession. Thus, from our results, we can claim that as the severity of the economic downturns lessens over the medium term, we should expect a contraction of inequality in income and consumption in the UK. Finally, we show that the term

spread can predict UK's income inequality growth both in- and out-of-sample and it is the expected component part of the term spread that is predicting lower income inequality in the UK.

## References

Barro, Robert J. "Inequality and Growth in a Panel of Countries." *Journal of Economic Growth* 5.1 (2000): 5-32.

Berisha, Edmond. "Yield spread and the income distribution." *The Quarterly Review of Economics and Finance* 65 (2017): 363-377.

Bonser-Neal, Catherine, and Timothy R. Morley. "Does the yield spread predict real economic activity? A multicountry analysis." *Economic Review-Federal Reserve Bank of Kansas City* 82.3 (1997): 37.

Chan, Joshua, and Eric Eisenstat. "Efficient estimation of Bayesian VARMA with time-varying coefficients." *Journal of Applied Econometrics* 32.7 (2017): 1277-1297.

De Santis, Roberto A. "Wage inequality in the United Kingdom: trade and/or technology?" *World Economy* 26.6 (2003): 893-909.

Dorling, Danny. "Income inequality in the UK: Comparisons with five large Western European countries and the USA." *Applied Geography* 61(2015): 24-34.

Estrella, Arturo, and Gikas A. Hardouvelis. "The term structure as a predictor of real economic activity." *The Journal of Finance* 46.2 (1991): 555-576.

Fama, Eugene F., and Kenneth R. French. "Business conditions and expected returns on stocks and bonds." *Journal of Financial Economics* 25.1 (1989): 23-49.

Faber, Benjamin, and Thibault Fally. *Firm heterogeneity in consumption baskets: Evidence from home and store scanner data*. No. w23101. *National Bureau of Economic Research*, (2017).

Gil-Alana, Luis A., and Antonio Moreno. "Uncovering the US term premium: an alternative route." *Journal of Banking & Finance* 36.4 (2012): 1181-1193.

Kattuman, Paul, and Gerry Redmond. "Income inequality in early transition: the case of Hungary 1987–1996." *Journal of Comparative Economics* 29.1 (2001): 40-65.

Koop, Gary, M. Hashem Pesaran, and Simon M. Potter. "Impulse response analysis in nonlinear multivariate models." *Journal of Econometrics* 74.1 (1996): 119-147.

Kuznets, Simon. "Economic growth and income inequality." *The American Economic Review* 45.1 (1955): 1-28.

Monnin, Pierre. "Inflation and income inequality in developed economies." *CEP Working Paper Series* (2014).

Mumtaz, Haroon, and Angeliki Theophilopoulou. "The impact of monetary policy on inequality in the UK. An empirical analysis." *European Economic Review* 98 (2017): 410-423.

Pierdzioch, Christian, Rangan Gupta, Hossein Hassani, and Emmanuel Sirimal Silva. "Forecasting Changes of Economic Inequality: A Boosting Approach." *The Social Science Journal* (2019): DOI: <https://doi.org/10.1016/j.soscij.2019.09.001>.

Rossi, Barbara. "Optimal tests for nested model selection with underlying parameter instability." *Econometric Theory* 21.5 (2005): 962-990.

Wang, Yiru, and Barbara Rossi. "VAR-Based Granger-Causality Test in the Presence of Instabilities." *Stata Journal* (Forthcoming).

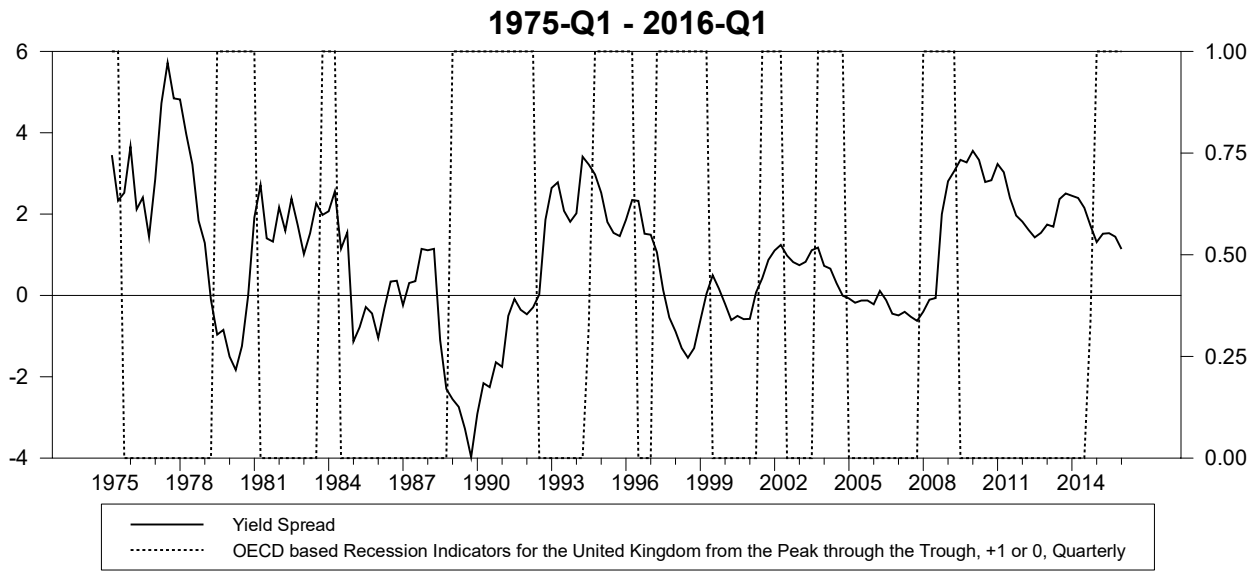
Shi, Shuping, Peter CB Phillips, and Stan Hurn. "Change detection and the causal impact of the yield curve." *Journal of Time Series Analysis* 39.6 (2018): 966-987.

Shi, Shuping, Stan Hurn, and Peter CB Phillips. "Causal Change Detection in Possibly Integrated Systems: Revisiting the Money-Income Relationship." *Journal of Financial Econometrics* (Forthcoming).

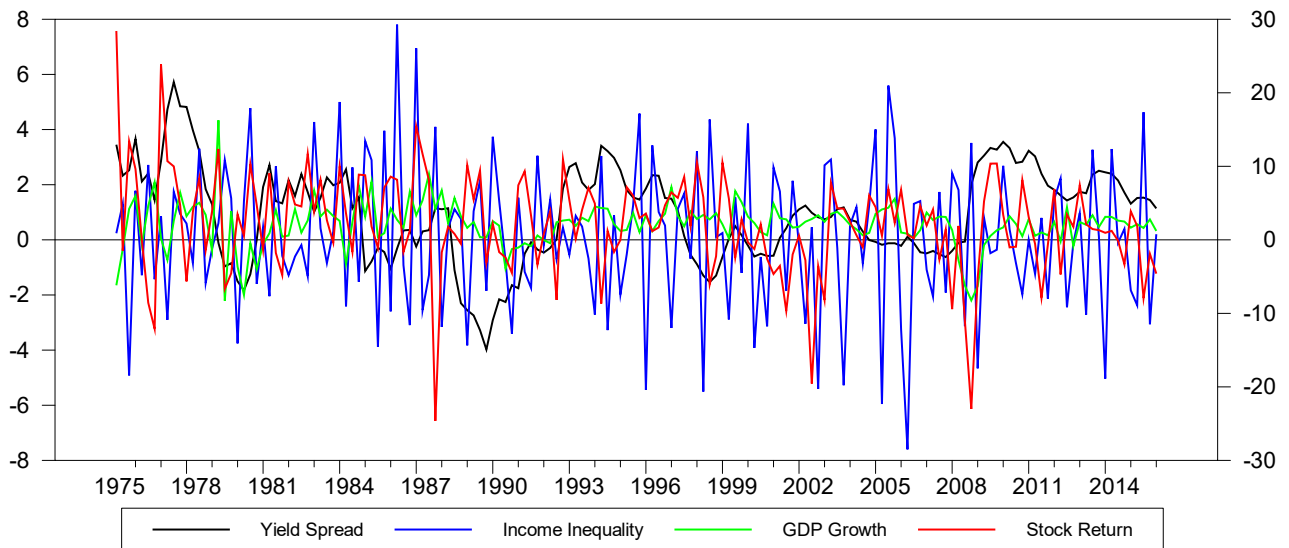
Shin, Inyong. "Income inequality and economic growth." *Economic Modelling* 29.5 (2012): 2049-2057.

Wheelock, D.C., and Wohar, M.E. (2009). Can the term spread predict output growth and recessions? A survey of the literature review, *Federal Reserve Bank of St. Louis*, September, 419-440.

**Figure 1. Yield Spread and Recession Indicators for the United Kingdom**

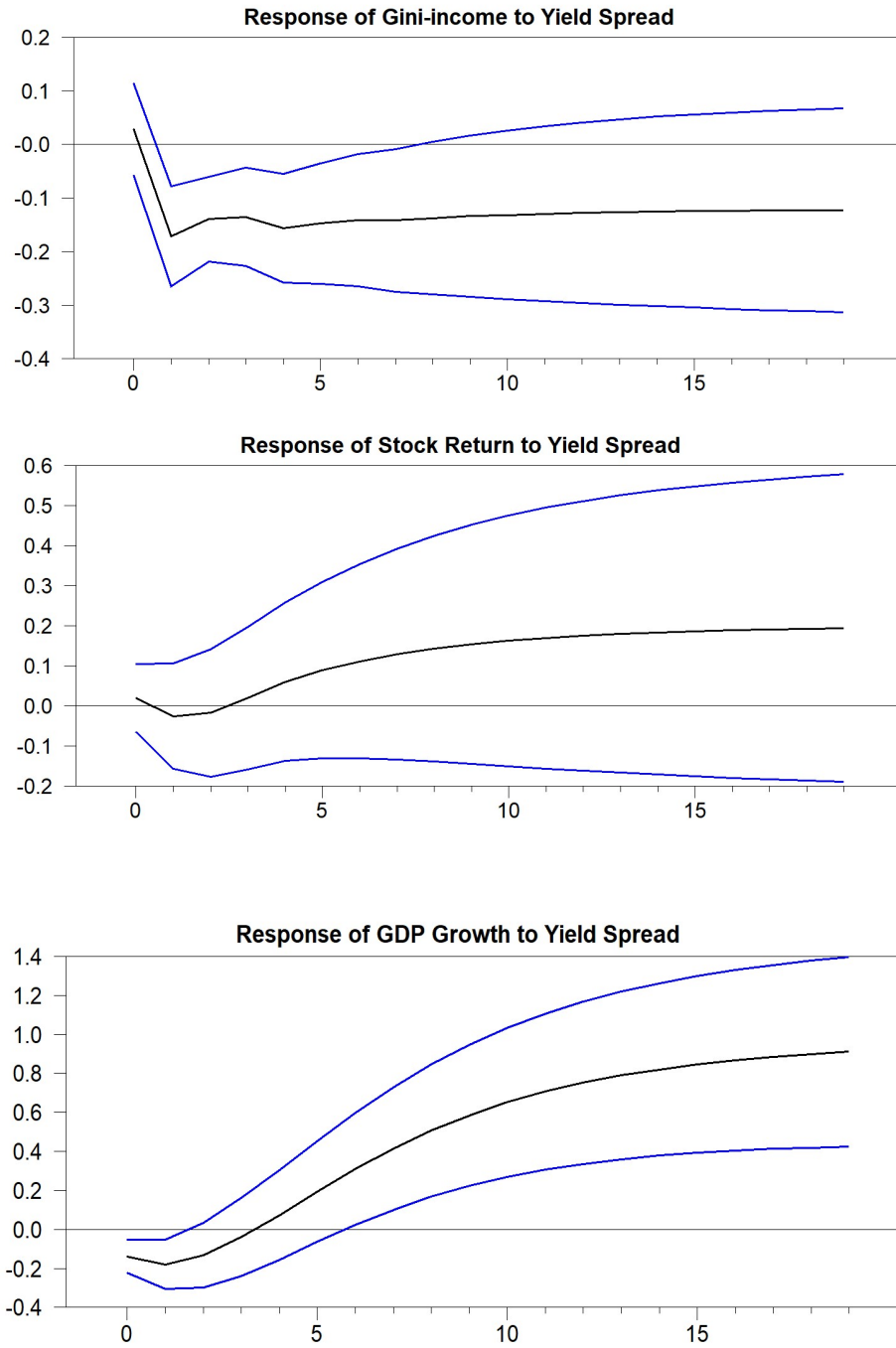


**Figure 2: Time Series of Yield Spread, Income Inequality, GDP Growth, and Stock Returns**

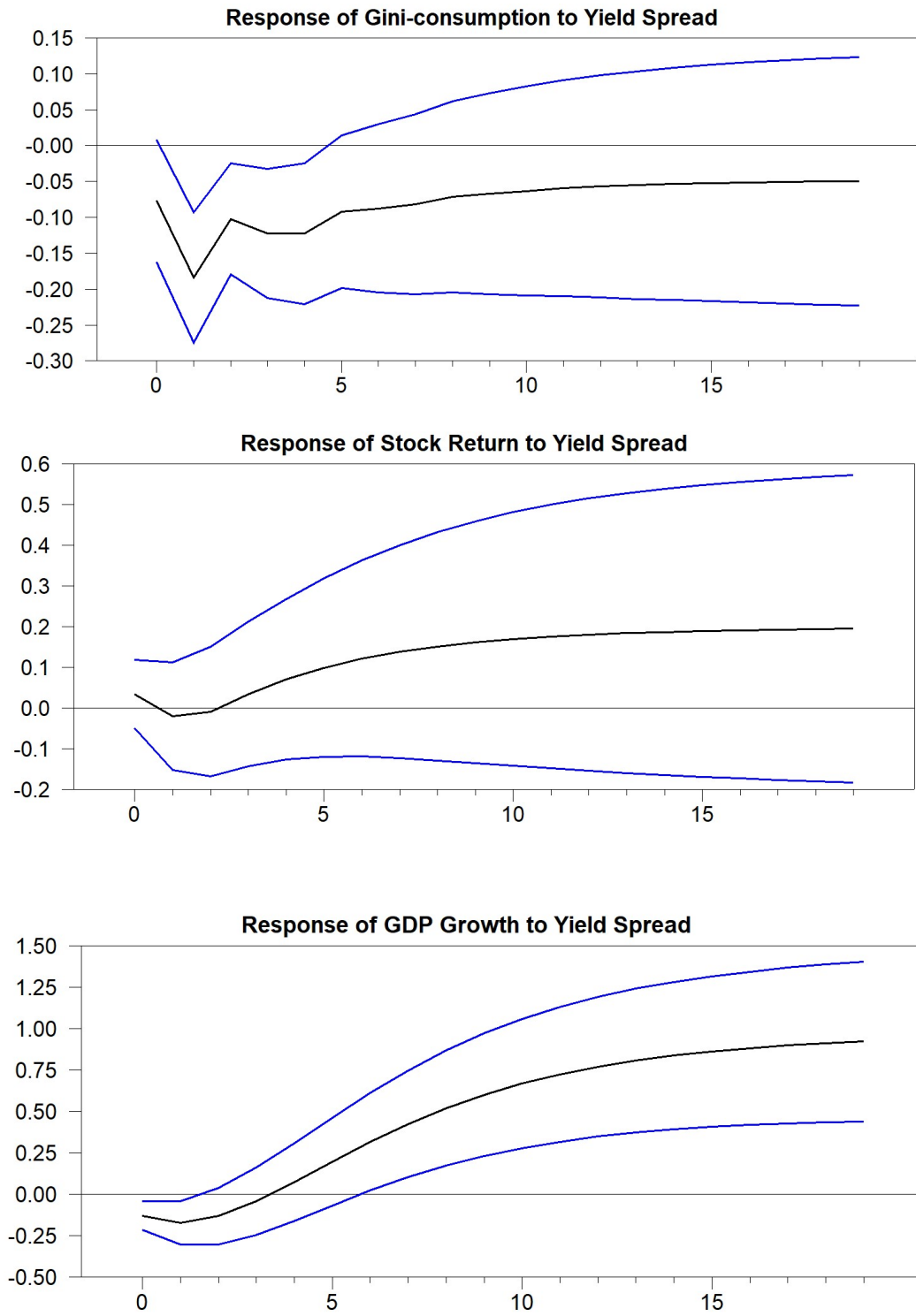




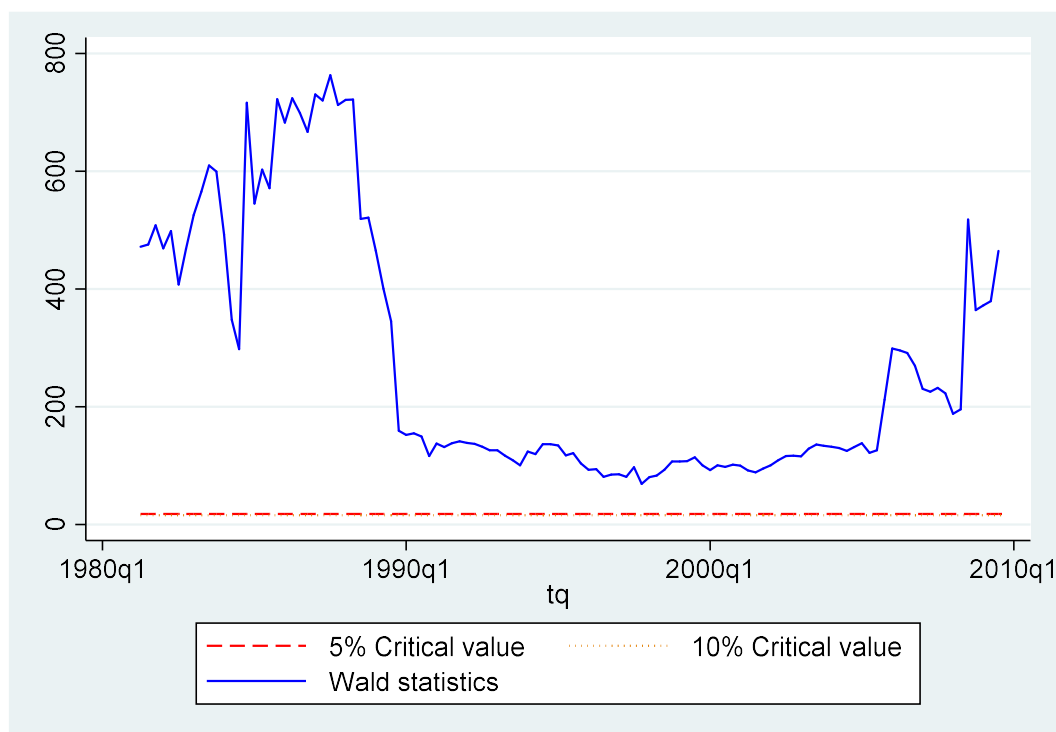
**Figure 3.** The Impact of the Term Spread Shock on the Variables of the VAR Model with Income Inequality



**Figure 4.** The Impact of the Term Spread Shock on the Variables of the VAR Model with Consumption Inequality



**Figure 5.** Time-Varying Granger Causality Statistic Running from Term Spread to Growth of Income Inequality

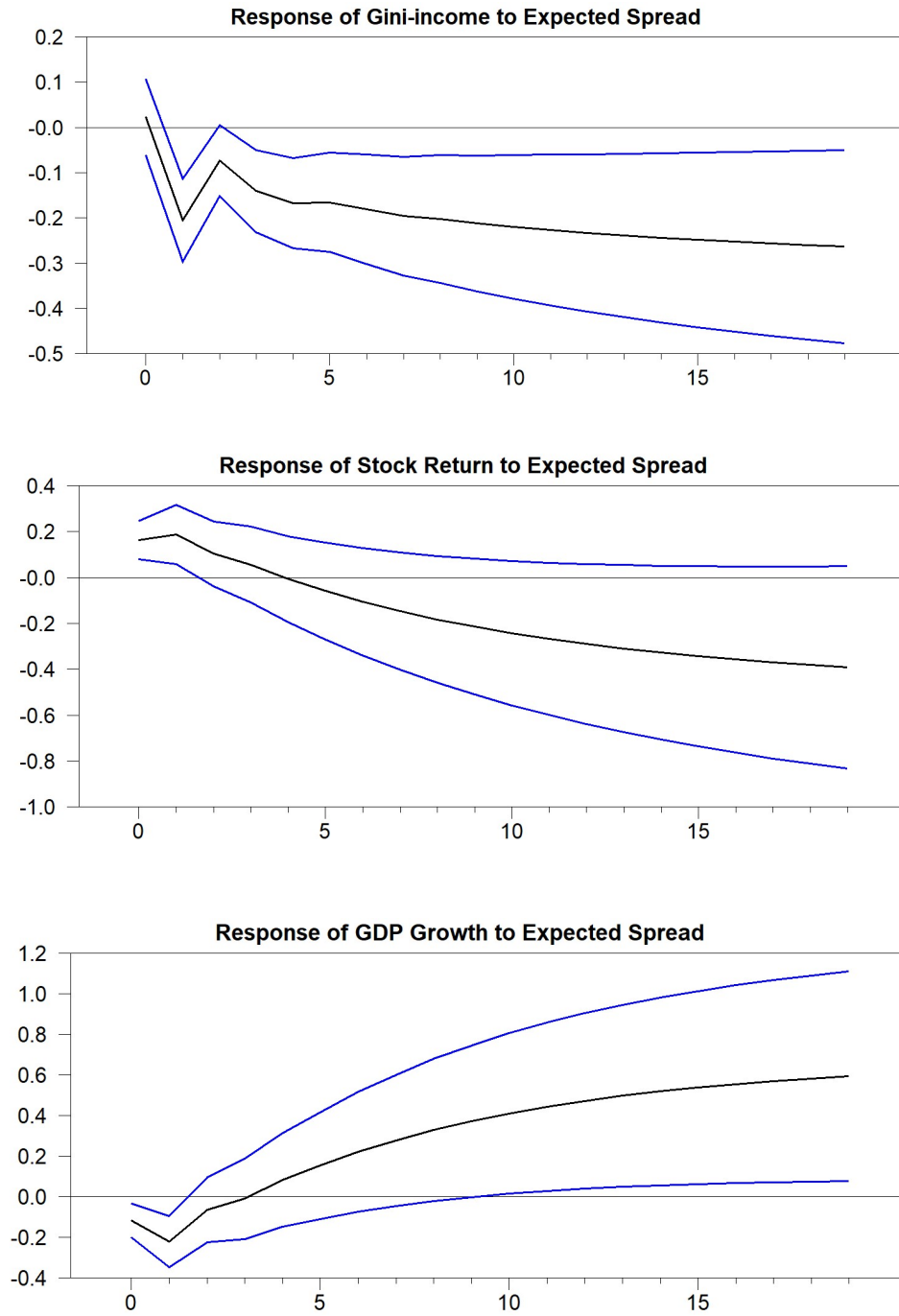


**Table 1.** Relative log predictive likelihoods for 1, 2-, and 3-quarter-ahead density forecasts (compared to the random walk model)

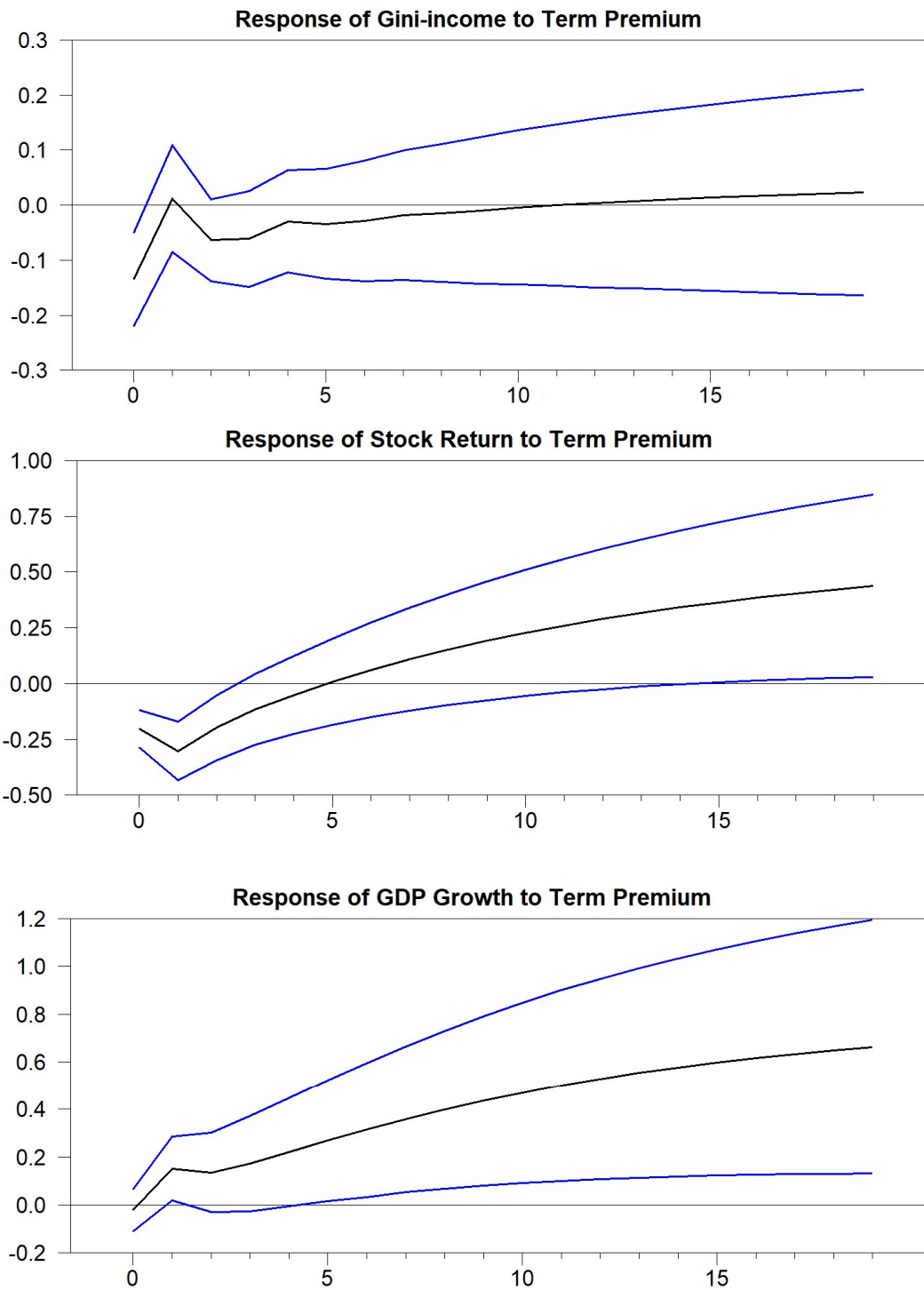
Models	Forecast Horizon		
	1-quarter-ahead	2-quarter-ahead	3-quarter-ahead
VAR(2)	75.8	61.6	76.8
VAR(2)-SV	66.8	53.8	67.7
VARMA(2,1)	75.8	61.3	76.7
VARMA(2,1)-SV1	75.9	59.7	75.6
VARMA(2,1)-SV2	75.3	59.8	75.5
TVP-VARMA(2,1)-SV2	74.3	59.1	76.1

**Note:** The order of the VAR is 2, while that of the MA component is 1; SV stands for stochastic volatility, with SV1 and SV2 corresponding to models of stochastic volatility without and with the time-varying MA part.

**Figure 6(a).** The Impact of the Expected Spread Shock on the Variables of the VAR Model with Income Inequality



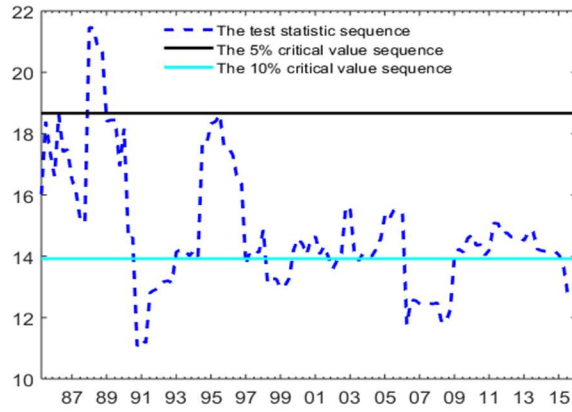
**Figure 6(b).** The Impact of the Term Premium Shock on the Variables of the VAR Model with Income Inequality



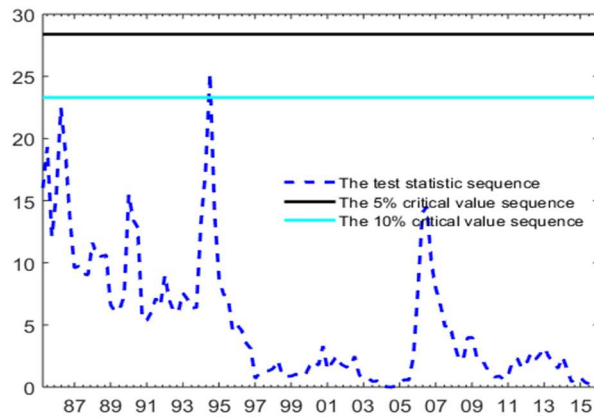
**APPENDIX:**

**Figure A1:** Tests Results for Recursive, Rolling and Recursive-Rolling Granger Causality Running from the Term Spread to Growth of Income Inequality

(a) Recursive



(b) Rolling



(c) Recursive-Rolling

