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# The Relationship between Economic Uncertainty and Firms' Balance Sheet Strength

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## Abstract

This chapter aims to elaborate on the relationship between economic uncertainty and balance sheet strength of nonfinancial firms in Turkish economy. In order to effectively measure the balance sheet strength, we make use of a multivariate indicator, namely, the Multivariate Firm Assessment Score (MFA Score), which is a composite index to gauge the credit risk of nonfinancial firms quoted in Borsa İstanbul. MFA scores are compared with some uncertainty indicators for the period of 2005–2019. Our results suggest that when the uncertainties in global or Turkish economy are high, we observe a significant causal relationship from uncertainty indicators to firms' balance sheet strength. More specifically, economic uncertainties negatively affect firms' balance sheet performance in such an environment. Moreover, different types of uncertainties such as trade policy uncertainty and consumer perceptions about the economy are found to have differential impacts on exporter and non-exporter firms.

**Keywords:** financial distress, MFA score, economic uncertainty, time-varying causality

## 1. Introduction

Economic uncertainty, in a broad sense, is defined as the situation where future outlook for the economy is unpredictable. In case of rising uncertainty, agents in the economy are negatively affected because their expectations are blurred and they are not able to foresee the consequences of their decisions. For instance, consumers having uncertain expectations about their future income stream would prefer to postpone their consumption today and save more in order to obtain smooth path of lifetime consumption. This behavior, named as precautionary saving motive [1, 2], may dampen economic activity and aggregate demand in the economy in the short run [3]. Governments' public policy decisions are also influenced, but in this case, they are generally in the role of alleviating the negative impact of diminishing economic activity due to rising uncertainty [4]. They enact countercyclical policies such as fiscal expansion, tax cuts, or social transfers when uncertainty rises [5].

Firms' investment decisions are also impacted by the economic uncertainty. If uncertainty rises in an economy, firms wishing to make investment today may need to delay their decision because they become unsure about whether the future cash

flows of the firm will cover the cost of the investment [6, 7]. This situation will indirectly affect other decisions of the firms such as employment, credit usage, debt repayments, social insurance payments, and other factors. In addition to all these factors, it is inevitable that firms' balance sheet structure and ratios are also affected by uncertainty in an economy. In case of elevated uncertainty, since consumption is postponed, firms' net sales decline, and this negatively influences their profitability ratios. Furthermore, firms' indebtedness might decline because their investment is also postponed and they no longer need to borrow to finance their investment. Firms' cash holdings and liquidity ratios might improve, as they want to stay highly liquid against any negative shocks under rising uncertainty. Last but not least, firms' cost of finance and interest expenses may be negatively affected, as heightening uncertainty might lead to an increase in risk premium and depreciation in the currency where the firms' borrowing is denominated in. All these channels, and possibly more than these, explain the transmission between economic uncertainty and firm balance sheet performance. Motivating from these verities, the main objective of this chapter is to empirically analyze the impact of economic uncertainty on firms' balance sheet performance using the financial statements of real sector firms quoted in Borsa İstanbul.

There is a wide range of literature on the relationship between firm balance sheet performance and overall macroeconomic dynamics for different countries. For instance [8] analyzes the implications of macroeconomic instabilities and institutional factors on the financial distress of Chinese-listed companies. [9] assesses the influence of macroeconomic conditions on the debt currency composition of firms in Brazil and how exchange rate movements impact the balance sheets and investment decisions of firms. In a cross-country setting, [10] questions whether the use of macroeconomic and industrial indicators improves the performance measures of solvent and insolvent firms. Finally, [11] deals with the balance sheet impact of foreign currency debt and exchange rate depreciation on the investments of firms in Korea.

In addition, there is a huge literature dealing with the impact of uncertainty on overall economy as well as other dimensions of the economy. One strand of the literature investigates directly the possible influence of uncertainty shocks on economic activity and finds out that uncertainty negatively impacts the aggregate demand [12–16]. Another strand of the literature looks at the issue by empirically analyzing how uncertainty impacts the households' consumption [17–19]. There are also many studies analyzing the implications of uncertainty with firms' perspectives. Although the majority looks at the effect of uncertainty on firms' investment decisions [20–24], some studies focus on the impact of uncertainty on firms' balance sheets. Nguyen, Kim, and Papanastassiou [25] investigate the link between economic policy uncertainty and financial derivative usage of firms in East Asia and find that as uncertainty accelerates, firms use derivative instruments extensively to hedge their risks. Hankins et al. [26] document the relationship between political uncertainty and corporate cash holdings of the US firms and finds out that following an uncertainty shock, cash accounts increase and capital spending declines. A similar study by Feng, Lo, and Chan [27] on Chinese firms claims that firms with higher firm value increase their cash holdings more than other firms as economic policy uncertainty heightens. In their cross-country study with firm-level data set, Gungoraydinoğlu, Çolak, and Öztekin [28] report that firm leverage drops in the wake of rising political uncertainty. In their study on US public corporates, Tran and Phan [29] obtain that policy uncertainty is positively related to the cost of debt and negatively related to maturity of debt. Francis, Hasan, and Zhu [30] find that rising political uncertainty increases the borrowing costs of nonfinancial firms. Iqbal, Gan, and Nadeem [31] document that economic policy uncertainty adversely affects firms' performance proxied by return on equity, return on assets, net profit margin, and Tobin's Q.

The common point of the abovementioned firm-level studies is that they look at the impact of uncertainty on a univariate balance sheet indicator or a single aspect of firm performance. Nevertheless, so far no study deals with the link between uncertainty and overall firm performance measured by a multivariate indicator. In this respect, our study introduces a novel approach by analyzing the impact of uncertainty on a multivariate composite indicator produced from firms' balance sheets. There are several composite indicators suggested by the literature to measure the overall firm performance [32–35]. However, these indicators were mostly designed for the listed firms in developed countries and may not be appropriate for measuring the performance of Turkish firms. Hence, in this study, MFA score developed by Çolak [36] using the data of Borsa İstanbul firms is used as a more accurate indicator since it captures the distinctive characteristics of Turkish firms.

Additionally, in investigating the association between firm performance and uncertainty, another important issue is the type of uncertainty examined. In the literature, numbers of uncertainty measures are created, such as political, trade, fiscal policy, monetary policy, financial, news uncertainties, and many more [5, 37–40]. In our chapter, our main concern is the overall economic uncertainty, consumer, financial, and trade uncertainties since we believe these factors are directly related to firms' balance sheets.

The chapter is structured as follows: after introduction, we will explain the details of the data set we exploited and methodology used in our analyses. In the third section, we will explain our main results. And finally, we will provide concluding remarks.

## 2. Data and methodology

Our sample consists of the financial statements of 417 nonfinancial firms quoted in Borsa İstanbul between 2005Q1 and 2019Q1 at a quarterly frequency. This corresponds to, on average, 300 firm observations each quarter and 13,356 unique observations in total. Real sector firms are obtained by eliminating the financial sector firms, sport companies, and real estate investment funds from the population of BIST firms. Quarterly income statement items are annualized by aggregating the latest four quarters.

Initially, we measure balance sheet strength of the listed real sector firms in Borsa İstanbul (BIST) with a composite index called Multivariate Firm Assessment Score (MFA score) which combines different corporate finance ratios such as liquidity, leverage, and profitability. This index which have a 90 percent predictive power improves Altman Z-score [32] methodology for Turkish firms. Specifically, using the multivariate discriminant analysis (MDA) methodology for the seven financial ratios explained in **Table 1**, we obtain MFA score for each firm in the sample.

Later on, we removed the firms with MFA scores above the 95th percentile and below the 5th percentile in the entire sample, in order to eliminate the outlier observations. Finally, we take the average of MFA scores and obtain mean MFA scores for each quarter. The descriptive statistics of the ratios in the MFA score and MFA score itself is provided in **Table 2**.

In the analysis, we consider four uncertainty indices: economic uncertainty, financial uncertainty, and consumer uncertainty indices which are developed by Sahinoz and Cosar [5], and trade uncertainty index for the Turkish economy from Ahir, Bloom and Furceri [41]. Consumer uncertainty index is a survey indicator which shows the uncertainty perception of consumers in the economy, while

$MFA\ score = 0.24 X_1 - 0.14 X_2 - 0.03 X_3 + 3.76 X_4 - 0.72 X_5 + 0.20 X_6 + 1.14 X_7$
$X_1 = (CashEquivalents + Securities + ShortTermTradeRecievables) / (ShortTermLiabilities):$
This indicator, also known as the acid-test ratio, shows how much the short-term debt of the firm can be met with cash and cash equivalents
$X_2 = ShortTermLiabilites / CurrentAssets :$
It measures the firm's ability to pay its short-term liabilities with short-term assets
$X_3 = TotalLiabilities / Equities$
It shows how much sufficient the firm's equities to pay its debt
$X_4 = EBITDA / TotalAssets$
It is the profitability of the firm from its main activities by asset size
$X_5 = FinancialExpenses / NetSales$
Indicates the capacity of the company to pay the FX and interest expenses arising from its debts
$X_6 = NetProfit(Loss) / NetSales$
It is the net earnings (or loss) of the firm per sale at the end of the period
$X_7 = Retained\ Earnings / Total\ Assets$
It is the measure of cumulative profit or loss from the past periods. It also contains information about the age of the company

**Table 1.**  
*MFA score equation and variable definitions.*

Variable	Obs.	Mean	Std. dev.	Min	Max
Acid-test ratio	13,356	1.43	1.59	0.00	28.68
ST liabilities/current assets	13,356	0.83	0.82	0.03	19.99
Total liabilities/equity	13,356	2.36	6.27	−1.52	134.45
EBITDA/assets	13,356	0.08	0.10	−0.80	0.86
Financial exp./sales	13,356	0.05	0.33	−14.84	6.46
Net profit/sales	13,356	0.02	0.93	−47.80	18.28
Retained earnings/assets	13,356	−0.01	0.43	−5.05	1.23
MFA score	13,356	0.42	1.02	−3.48	3.28

**Table 2.**  
*Descriptive statistics of MFA score variables.*

financial uncertainty index mostly indicates market volatility through global financial conditions. On the other hand, economic uncertainty is a weighted index of consumers, producers, forecasters, and economic policy uncertainty indices in a dynamic factor model framework. Finally, trade uncertainty index measures uncertainty related to trade in the Economist Intelligence Unit country reports. The descriptive statistics of uncertainty indices are exhibited in **Table 3**.

The movement in the economic uncertainty index for Turkish economy over time is depicted in **Figure 1**. It is evident from the figure that there are two specific episodes, where uncertainty has risen sharply. The first one is the global financial crisis from 2008 till the last quarter of 2009 and the other one corresponds to the period after the 2018 foreign exchange market turbulence in Turkey. In this study, we will give particular attention to these episodes to investigate the causality from uncertainty to firm balance sheets.



Uncertainty indices	Obs.	Mean	Std. Dev.	Min	Max
Economic	57	0.07	0.83	−0.90	2.60
Financial	57	−0.05	0.93	−1.30	3.20
Consumer	57	0.02	1.13	−1.10	5.90
Trade	57	0.33	0.20	0.00	0.89

**Table 3.**  
*Descriptive statistics of uncertainty indices.*



**Figure 1.**  
*Economic uncertainty index for Turkey. Source: Cosar and Sahinoz [5].*

Our econometric analysis basically use time-varying Granger causality between an uncertainty index and MFA score based on Rossi and Wang [42] paper. This methodology is more powerful if the series have instabilities. In addition, classical Granger causality test does not allow to drive time-varying parameters. VAR-based reduced-form Granger causality test requires stationarity in the data, and its test statistics is not valid if the series have potential structural breaks. Because of the nonstationary nature and existence of structural breaks in **Figure 1**, Rossi and Wang’s [42] is the best methodology to analyze time-varying Granger causality with this data.

Following Rossi and Wang [42], Eq. (2) shows a reduced-form time-varying parameter VAR:

$$A_t(L)y_t = u_t \tag{1}$$

$$A_t(L) = I - A_{1,t}L - A_{2,t}L^2 - \dots - A_{m,t}L^m \tag{2}$$

$$u_t \overset{iid}{\sim} (0, \Sigma) \tag{3}$$

where  $A_{j,t}, j = 1, \dots, m$  show time-varying coefficients,  $[y_t, y_{t-1}, \dots, y_{t-m}]'$  show variables in the model, and  $u_t$  shows error term.

The iteration of Eq. (2) and projection of  $y_t$  onto the linear space created by  $(y_{t-1}, y_{t-2}, \dots, y_{t-m})'$  derive the following equation:

$$y_t = \beta_{1,t}y_{t-1} + \beta_{2,t}y_{t-2} + \dots + \beta_{m,t}y_{t-m} + \varepsilon_t \tag{4}$$

where  $\beta_{j,t}, j = 1, \dots, m$  show time-varying coefficients,  $[y_t, y_{t-1}, \dots, y_{t-m}]'$  show variables in the model, and  $\varepsilon_t$  shows heteroskedastic and serially correlated error term.

Finally, based on Eq. (4), robust Granger causality test figures out the validity of the null hypothesis in Eq. (5):

$$H_0: \beta_t = 0, \text{ for all } t = 1, \dots, T \tag{5}$$

### 3. Empirical results

In the analysis we use two variables, an uncertainty index and a firm performance measure (MFA score). As these two variables are composite measures, although the methodology allow, we do not control other variables in the regressions. Based on Schwarz information criteria (SIC), we determine the number of lags included in the VAR model as two. In addition, following Rossi and Wang [39], we choose trimming parameter as 0.15 which is commonly used in structural break literature. After the estimation, we plot Wald test statistics through time which shows the strength of time-varying Granger causality from uncertainty measure to the firm performance measure.

We start our analysis by looking at the predictive ability of economic uncertainty on MFA score. Economic uncertainty index is constructed from five sub-uncertainty indices (forecasters' uncertainty index, financial uncertainty index, firms' uncertainty index, consumers' uncertainty index, and economic policy uncertainty index) via dynamic factor models explained by Cosar and Sahinoz [37].

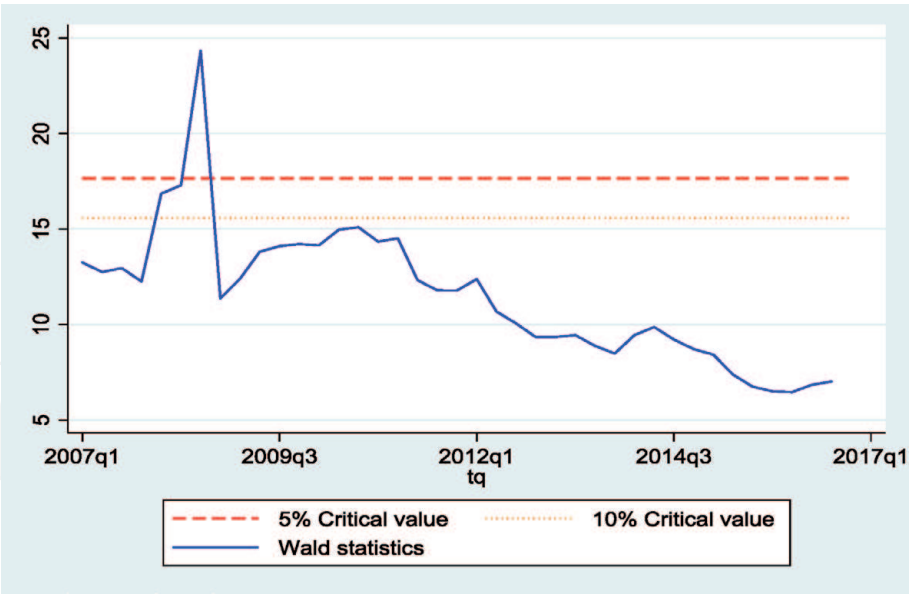
**Table 4** shows the results of classical Granger causality test for VAR (2) model which indicates that there is a causality only at 10% level for the whole sample. Moreover, traditional Granger causality test suffers from instabilities in the data and does not show time variability in causality which is the critical point that this chapter tries to address.

**Figure 2** gives Wald statistics over time, which shows that the predictive power of economic uncertainty is increasing during 2008 global financial crisis. By choosing trimming parameter as 0.15, we are losing 16 observations from the beginning and end of the sample period. Hence, the latest observation is the 2016Q1 in this case, which leads us not to observe the recent financial distress period.

**Figure 2** depicts that there is a significant Granger causality from economic uncertainty towards balance sheet performance of BIST firms in our sample. The global financial crisis is associated with significant contraction in economic activity, rise in unemployment, and fall in investment and consumption spending in Turkish economy. Year-on-year growth rate of GDP dropped as high as (–5) percent in 2009. These adverse developments in that era caused firms' financial health to worsen, as could be monitored through declining MFA scores. Following global crisis, Turkish economy did not experience substantial shrinkage in the economic activity till 2016, which would damage the firms' performance. Some temporary shocks such as European debt crisis or tapering tantrum have been alleviated by the effective fiscal and monetary policies. The statistically insignificant values of Wald

Zero hypothesis (H0)	Chi2	P-value	Decision
Econ uncertainty does not Granger-cause MFA score	5.8797	0.053	Do not reject

**Table 4.**  
*Granger causality test for the whole sample.*

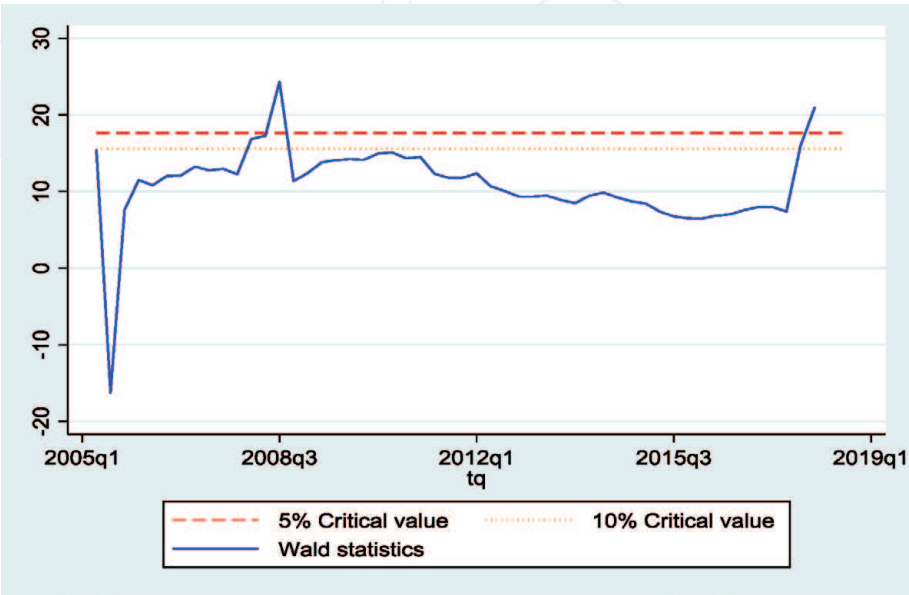


**Figure 2.**  
Wald statistics of the test,  $H_0$ : economic uncertainty does not Granger-cause MFA score. Notes: VAR(2) under SIC, trimming 15%.

statistics after the global crisis indicate that, in normal times, there is no causality from economic uncertainty to firm performances.

In order to check the effect of Turkey-specific currency volatility observed in 2018 on firms' scores, we take trimming parameter as 0.03, which allows us not to lose any observation. With the coverage of data for the year 2018, **Figure 3** indicates that there is a jump in Wald statistics meaning that Granger causality occurs at this period as well. This local-sourced turbulent period in 2018 led Turkish lira to devalue by nearly 35 percent against US dollar. Due to the rising volatility in exchange rate, inflation soared, interest rates climbed up, and economic activity contracted, which led to a mounting economic policy uncertainty.

Turkish firms accumulated large foreign currency debt after the global crisis since the expansionary monetary policies in advanced countries caused Turkish banks to reach foreign currency funding at low costs and with long maturities.



**Figure 3.**  
Wald statistics of the test,  $H_0$ : economic uncertainty does not Granger-cause MFA score. Notes: VAR(2) under SIC, trimming 3%.

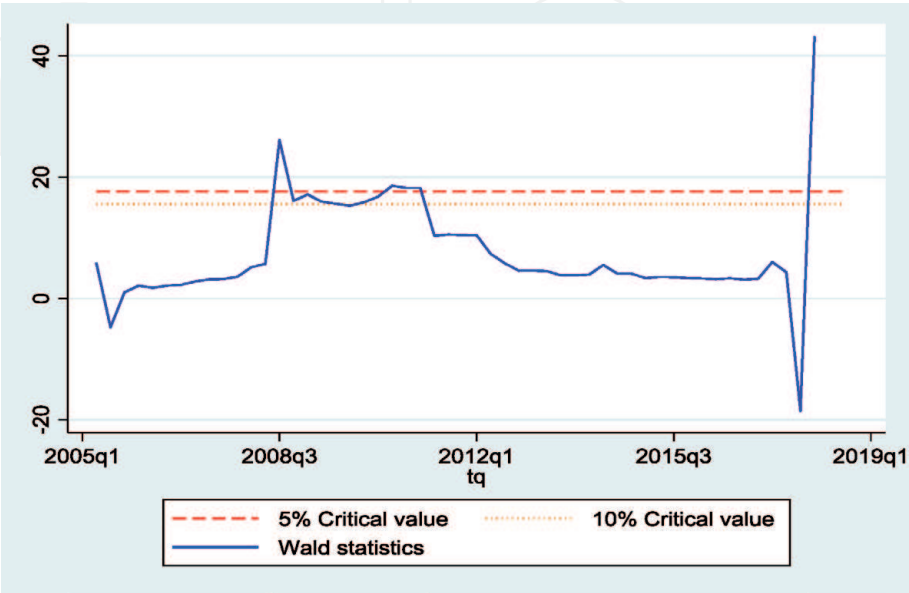


Banks utilized these funds as loans to real sector firms, even the ones without any FX income. Firms without FX income lived with considerable FX mismatches in their books. As a result, the sharp depreciation of Turkish lira in 2018 created a substantial deterioration in the balance sheets of real sector, and many firms defaulted since they could not repay their FX debts. In that period, MFA scores have dropped as high as the fall in global crisis.

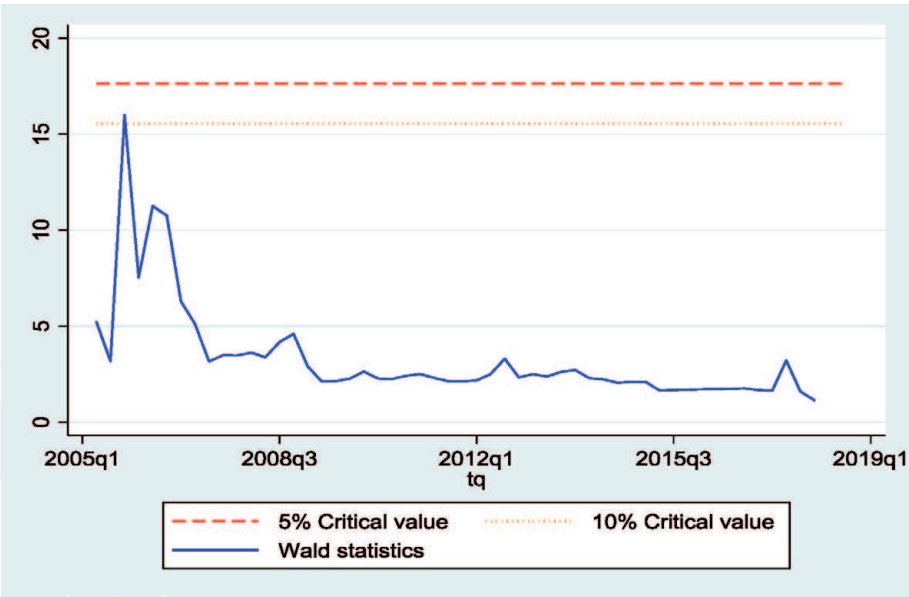
The rising Wald statistics in that period is an evidence of the significant causality from economic uncertainty to MFA scores as observed during the period of global crisis. As **Figure 3** suggests, there is no significant causality in normal times. Our overall evaluation from **Figures 2** and **3** is that when economic uncertainty accelerates, it significantly Granger-causes MFA scores to drop; nevertheless, when uncertainty is stable, there is no significant causality to firm performance.

One may question whether this causal relationship from economic uncertainty to firm performance can differentiate among different firm types. To answer this, we split the firms in our sample as exporters and domestic producers and check which type of uncertainty is important for exporters and non-exporters. Firstly, we check the causality from financial uncertainty to MFA scores. Financial uncertainty is a measure of volatility in global financial conditions such as VIX, EMBI, CDS, and exchange rate uncertainty [5]. One would expect that exporters are affected more from global financial conditions measured by the financial uncertainty index. Although exchange rate volatility is crucial for all economic agents, its effect is even higher for exporters. **Figures 4** and **5** show the results for exporters and non-exporters, respectively. While financial uncertainty has a strong effect in exporters' score in 2008 and 2018 volatility periods, none of those periods have a significant effect on domestic producers.

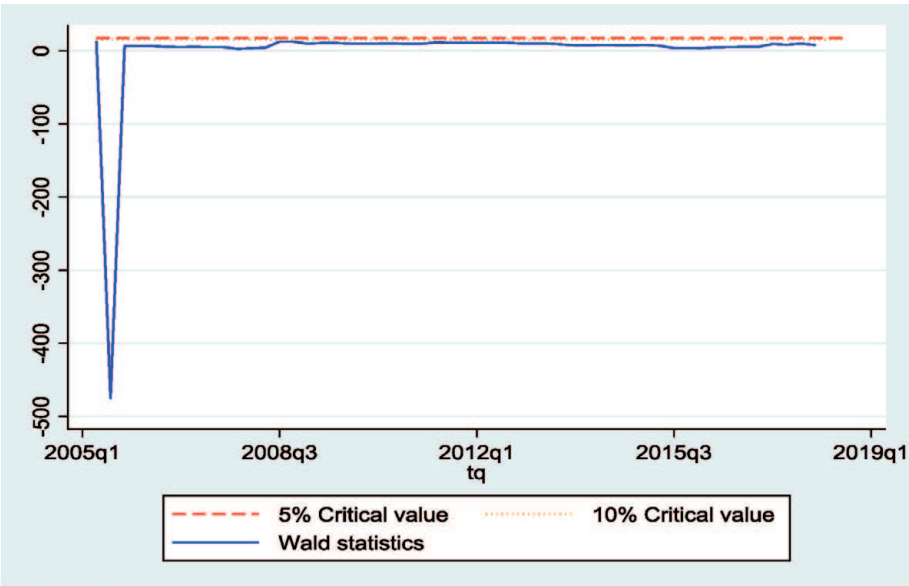
The potential uncertainty that can affect domestic producers is the uncertainty measuring the perception of consumers in Turkish economy. Hence, we estimate VAR(2) model with consumer uncertainty for exporters and non-exporters (**Figures 6–8**). Because of the big jump in 2005 in **Figure 6**, the explanatory power of consumer uncertainty on exporters is not clear with a trimming parameter of 3 percent. By using a trimming parameter of 0.15, we eliminate this period and see the exact relationship in **Figure 7**. As it is clear in the figure, the relationship is far from 10% significance level in the whole sample period for exporter firms. This



**Figure 4.** Wald statistics values of the test,  $H_0$ : financial uncertainty does not Granger-cause MFA score for exporter. Notes: VAR(2) under SIC, trimming 3%.



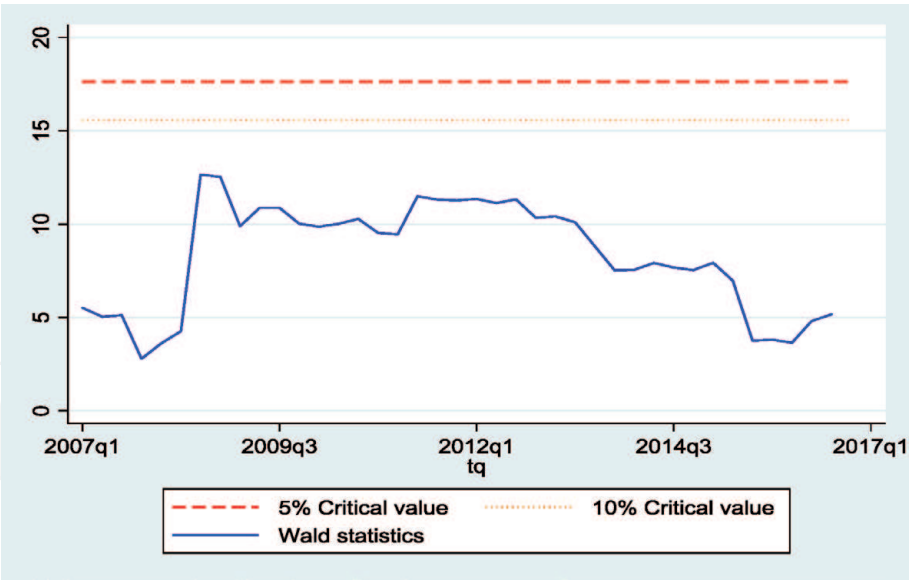
**Figure 5.**  
Wald statistics values of the test,  $H_0$ : financial uncertainty does not Granger-cause MFA score for non-exporters. Notes: VAR(2) under SIC, trimming 3%.



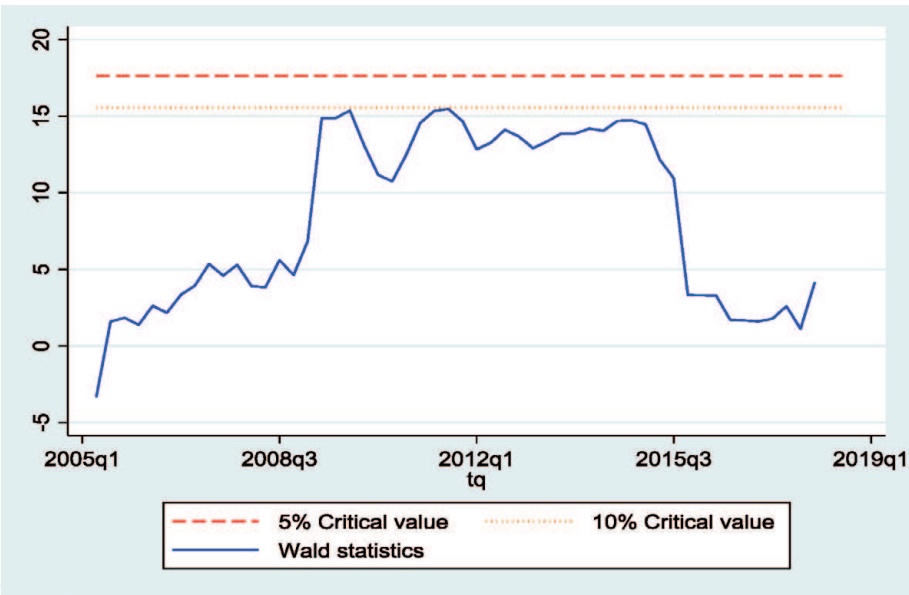
**Figure 6.**  
Wald Statistics Values of the Test,  $H_0$ : consumer uncertainty does not Granger-cause MFA score for exporters. Notes: VAR(2) under SIC, trimming 15%.

might be an expected result since perception of domestic consumers should not have an impact on exporting firms selling abroad. Global financial conditions or global consumer uncertainties are anticipated to have a more impact on exporter firms' performance.

On the other hand, as seen in **Figure 8**, Wald statistics improved extensively after 2009 and exceeded 10% critical levels at some points till 2015 for non-exporter firms. The period between 2010 and 2015 is associated with a sound economic growth with a low-level of interest rates and stable exchange rate. In that period, households' perceptions and future expectations were robust, while their wealth was also improving. This led to soaring consumption expenditures, which increased the sales of non-exporter firms. As a result, the balance sheet performance of non-exporter firms significantly strengthened. We infer from those developments that, as consumers' perception worsens, this does not lead to a causality from consumer



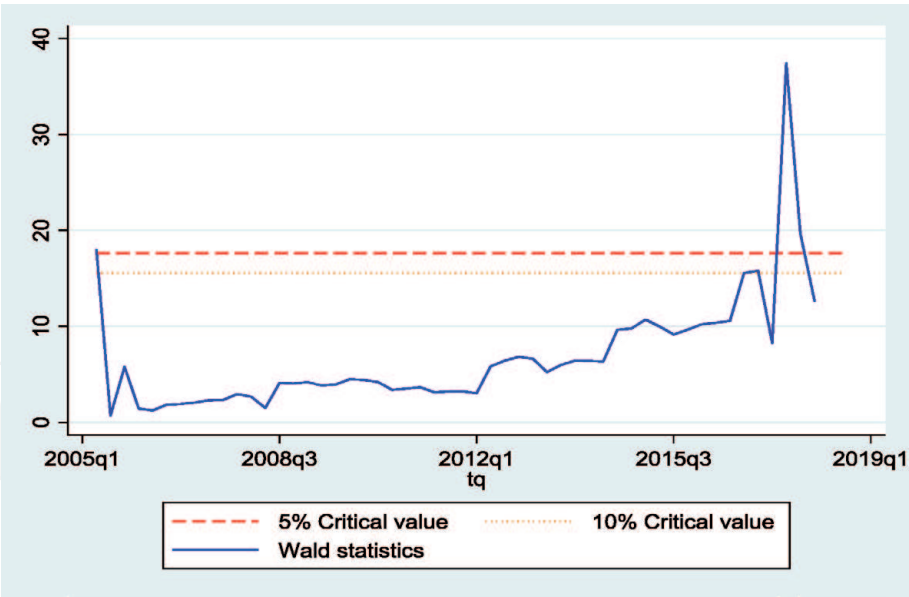
**Figure 7.**  
Wald statistics values of the test,  $H_0$ : consumer uncertainty does not Granger-cause MFA score for exporters.  
Notes: VAR(2) under SIC, trimming 15%.



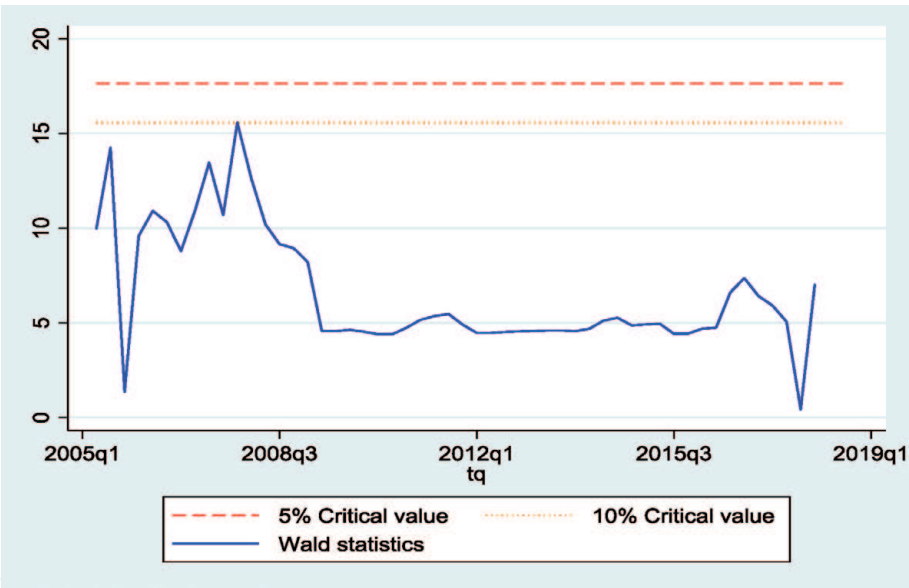
**Figure 8.**  
Wald statistics values of the test,  $H_0$ : consumer uncertainty does not Granger-cause MFA score for non-exporters. Notes: VAR(2) under SIC, trimming 3%.

uncertainty to the performance of non-exporter firms; nevertheless, as consumer perceptions improve, significant causality from consumer uncertainty index towards MFA scores of non-exporter firms occurs. Besides, for exporter firms, we do not observe a causal relationship in the periods of both improving and worsening consumer perception.

Since the separation of firms depends on their exporting behavior in this analysis, it will be useful to check the effect of trade uncertainty for exporters and non-exporters. Trade uncertainty has increased since 2017 following of Trump’s administration and the trade war between the USA and China. In **Figure 9**, trade uncertainty significantly impacts the performance of exporters, with the highest effect seen in 2017–2018. During that period, rising global trade uncertainty adversely influenced the global trade volume. Although high US dollar/Turkish lira exchange rate provided a competitive price advantage for Turkish firms, rising



**Figure 9.**  
Wald statistics values of the test,  $H_0$ : trade uncertainty does not Granger-cause MFA score for exporters. Notes: VAR(2) under SIC, trimming 3%.



**Figure 10.**  
Wald statistics values of the test,  $H_0$ : trade uncertainty does not Granger-cause MFA score for non-exporters. Notes: VAR(2) under SIC, trimming 3%.

global trade uncertainties significantly impacted the balance sheet performance of Turkish exporters. Nevertheless, since global trade was stable in earlier periods, it did not lead to a significant causal relationship. On the other hand, **Figure 10** illustrates that we do not observe such a significant effect on the non-exporters in our model since they do not interact with global trade conditions.

#### 4. Conclusion

In this chapter, we use a time-varying vector auto-regressive model to analyze the relationship between economic uncertainty and firms' balance sheet strength in Turkish economy over the 2005–2019 period. For this purpose, we utilize Multivariate Firm Assessment Score developed by Çolak [36] to calculate Turkish

firms' balance sheet strength. On the other hand, uncertainties in Turkish economy is measured by using four indices: economic uncertainty, financial uncertainty, consumer uncertainty indices which are developed by Cosar and Sahinoz [5], and trade uncertainty index introduced by Ahir et al. [41]. In our empirical analysis, based on Rossi and Wang [42], time-varying Granger causality between uncertainty indices and MFA score is evaluated.

Our first observation is that during heightened volatility periods such as the 2008 global financial crisis and 2018 Turkish domestic FX turmoil, economic uncertainties increased dramatically, and firms' balance sheet performances were negatively affected by those uncertainties. The transmission mechanism was different in those two turbulent periods. The global financial crisis was associated with significant contraction in economic activity, rise in unemployment, and fall in investment and consumption spending in Turkish economy. Those adverse developments in that era caused firms' financial health to worsen. However, during Turkish domestic FX turmoil in August 2018, the sharp depreciation of Turkish lira created a substantial deterioration in the balance sheets of real sector, and many firms were negatively affected since they have problems to repay their FX debts.

Second, while financial uncertainty is found to have a strong effect in exporter firms' performances, we do not observe a significant impact on non-exporter firms' in 2008 and 2018 stress periods. The intuition behind this result is that exporters are expected to be affected more by global financial conditions and heightened exchange rate volatility.

Third, since consumer perceptions about Turkish economy may be more effective on non-exporter (domestic producer) firms, we investigate to role of consumer uncertainty on the performance of Turkish firms. We show that as consumer perceptions improve, significant causality from consumer uncertainty index towards MFA scores of non-exporter firms occurs. However, we do not observe a causal relationship for exporter firms.

Finally, we check the effect of trade uncertainty, which is expected to be an important factor for exporter firms. Our analysis show that the trade uncertainty significantly impacts the performance of exporters, with the highest effect seen in 2017–2018 period during which global trade uncertainty increased dramatically following of Trump's administration and the trade war between the USA and China.

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