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Evidence for the Reliance of Equities on Liquidity and Bank Credit in the Agriculture Sector in Turkey

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Abstract

The study aims to determine the potential of a long-run relation among liquidity indicators and equities in the agriculture sector along with the usage of bank credit. The study runs general linear regressions for which it shares the results and it adds up a set of supplementary analysis on stability diagnostics including leverage plots and recursive estimation. The significant findings reveal that the level of equities in the agriculture sector is a function of bank credit used at a level which could also be predicted by the first two famous liquidity indicators namely current ratio and acid-test ratio. Therefore, any incentive easing the access to bank credit finance for the firms of agriculture sector would better be substituted with other encouragements which will rather promote the accumulation of equities so as to attain a sustainable finance with healthy liquid assets and the limited bank credit contribution.

Keywords: Equities, bank credit, liquidity, agriculture sector.

Türkiye Tarım Sektörü Örneğinde Öz Kaynakların Likidite ve Banka Kredisi Bağımlılığı

Öz

Çalışma, tarım sektöründe likidite göstergeleri ve öz kaynaklar arasındaki uzun dönemli ilişki potansiyeli ile birlikte banka kredisi kullanımını belirlemeyi amaçlamaktadır. Çalışma, sonuçlarını paylaştığı genel doğrusal regresyonlar ile kararlılık üzerine kaldıraç noktaları ve özyinelemeli tahmin için bir takım ilave analizleri de içermektedir. Yüksek anlamlılık derecesindeki çalışma bulguları, tarım sektöründe öz kaynakların düzeyinin kullanılan banka kredisinin bir fonksiyonu olduğunu ve aynı zamanda iki meşhur likidite göstergesi olan cari oran ve asit-test oranı ile de tahmin edilebileceğini ortaya koymaktadırlar. Bu nedenle, tarım sektöründe yer alan işletmeler için banka kredisi ile finansmana ulaşmayı kolaylaştıran teşviklerin, sağlıklı likit varlıklar ve sınırlı banka kredisi kullanımının da katkısıyla sürdürülebilir finansmana ulaşmak için daha çok öz kaynakların birikimine yol açacak diğer özendirme önlemleri ile ikame edilmeleri yerinde olacaktır.

Anahtar Kelimeler: Öz kaynaklar, banka kredisi, likidite, tarım sektörü.

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Introduction

Liquidity has a vital role in the sustainability of business finance. Available resources of long-term financing in bank credit for the long term and equities determine the scale and dependence of the businesses on various forms of liabilities where trade credit is rather preferred. In some sectors, bank credit and equity financing are naturally on the spot. As an example of such sectors; agriculture sector, on the other hand, has always been among the sensitive parts of the Turkish economy in which incentives are widely available. Healthy liquidity adds much on the ongoing performance of businesses preferably with a limited dependence on bank credit.

The study therefore aims to check the existence of a relation among liquidity indicators and equities along with the potential usage of bank credit in the very long run from 1996 and 2016 in terms of three years' averages of aggregate balance sheets in the agriculture sector. To reach this objective, the study runs general linear regressions and shares the results and presents a set of supplementary analysis on stability diagnostics including leverage plots and recursive estimation. The robustness and significance of the findings reveal that the level of equities in the agriculture sector is not only a function of bank credit used, but a level which could also be predicted by the first two famous liquidity indicators named as current ratio and acid-test ratio. Thus, we hereby conclude that the businesses of the agriculture sector would rather have a sustainable finance by their healthy liquid assets and the limited bank credit

contribution in their liabilities. We also recommend that any incentive easing the access to bank credit finance for the firms of agriculture sector would better be substituted with other encouragements which will rather promote the accumulation of equities and the limitation of financial credit by the help of a better liquidity attained in this explicit sector.

Materials and Method

The study restructures the methodology of Acikgoz, et al. (2018) by providing new series on the data. The new raw data has been transferred in percentages from the aggregate total balance sheet of Agriculture, Forestry and Fishery Sector (or Sector A of the NACE Rev II, nonfinancial businesses) retrieved from CBRT (Central Bank of the Republic of Turkey) data archives. The data excludes fishery and it has been given as agriculture, forestry and hunting up to 2011. Only for the year 2004, the data informs on the correction for financial statements in terms of inflation. On the long-term data (1996-2017), the study presents an appraisal on the data of the selected businesses of agriculture sector in Turkey with the real sector statistics and data archives of CBRT. The data consists of yearly based last three years aggregate balance sheet averages from 1996 to 2017 for the sector in the years 1998 up to 2016. The study uses the raw data of 2,222 firms from all scales (an overall average of 117) firms for each year) in the time span of 19 years in the agriculture sector. The three years averages are taken into consideration as the average of 1996, 1997, 1998 for the year 1998 and so on till 2017 (CBRT, 2018). The data gives 0.710 and 0.695 Cronbach's alpha and its value on standardized items respectively. 0.000 significance in Friedman's test and Tukey's test for nonadditivity for both between items and residuals nonadditivity (Cronbach, 1951; Cronbach, 2004; Friedman, 1937; Friedman 1939; Tukey, 1949). Excluding the Cash and Cash Equivalents (C&CE) as a percentage of Short-Term Liabilities (STL) or as the C&CE Ratio (C&CER) in the model, thus the variables of the study are given below:

EQU/TL (Equities as a percentage of Total Liabilities)
CR (Current Ratio, Current Assets as a percentage of STL)
ATR (Acid Test Ratio, The difference of Current Assets and Short Term Inventories as a percentage of STL)
STBC/STL (Short-Term Bank Credit as a percentage of STL)
LTBC/TL (Long-Term Bank Credit as a percentage of Total Liabilities)

We have conducted calculations on the variables of the study and designed a model in which EQU/TL is taken as the dependent variable. The below given equation refers to the model of the study where EQU (EQU/TL) is taken as the dependent variable with the independent variables CR, ATR, STBC (STBC/STL), and LTBC (LTBC/TL) where β_0 is the coefficient of the constant, β_i is the coefficients of the independent variables, and ε_{it} stands for the error terms.

$$Y_{EQU\ it} = \beta_0 + \beta_1 x_{CR\,it} + \beta_2 x_{ATR\,it} + \beta_3 x_{STBC\,it} + \beta_4 x_{LTBC\,it} + \varepsilon_{it}$$

We have tested the model so as to confirm the assumptions in the model's regression on autocorrelation, normality, heteroscedasticity, and the zero mean of residuals, and multi collinearity by sharing the general linear regression results (Pearson, 1920; Fisher, 1925; Fisher, 1932; Bartlett, 1950; Durbin and Watson, 1950; Durbin, 1970; Durbin and Watson, 1971; Breusch, 1978; Godfrey, 1978a; Godfrey, 1978b; Breusch and Pagan, 1979; Jarque and Bera, 1980; Jarque and Bera, 1987; Kutner et al., 2005). The study also conducts unit root tests for the group of the series with pairwise Granger causality tests, cointegration tests and runs an unrestricted VAR as well (Fisher, 1932; Granger, 1969; Akaike, 1973; Akaike, 1974; Granger and Newbold, 1974; Schwarz, 1978; Akaike 1979; Dickey and Fuller, 1979; Sims, 1980; Newey and West, 1987; Engle and Granger, 1987; Phillips and Perron, 1988; Johansen, 1988; Andrews, 1991; Lutkepohl, 1991; Sims, 1992; Newey and West, 1994; Johansen, 1995; Pesaran and Shin, 1998; MacKinnon-Haug-Michelis, 1999; Pesaran et al., 2000; Levin et al., 2002; Im et al., 2003; Enders, 2003; Lutkepohl, 2004; Sun et al., 2010). We have used stability diagnostics in the model versus variables in leverage plots with fit

lines as partial out variables along with the result for the diagnostics of CUSUM of squares test for recursive estimates (OLS only) thereunto (Belsley et al., 2004; Brown et al., 1975). We then appraise the raw data for the selected variables, and we present and discuss the findings in order to consider the implications as the conclusion.

Results and Discussion

Liquidity is measured with respect to short-term liabilities (Beaver, 1966; Altman, 1968; Altman and Narayan, 1997; Al-Attar and Hussain, 2004; Drever and Hutchinson, 2007; Min and Lee, 2008; Abdou and Pointon, 2011; Chen et al., 2011). However, both long-term liabilities and equities have impact on the liquidity of the firm or vice versa. In the agriculture sector, total assets could also be explicitly affected by both the short and the long term debt (Stekla and Grycova, 2016). There comes equity financing as an alternative. However, the risks upon leverage are also worth considering in agriculture, any desired financial risk is likely to increase after a reduction in terms of business risk (Collins, 1985). Lenders may have diverse influences on their lending decisions in agricultural finance as well (Featherstone et al., 2007). Short-term and long-term debt especially in terms of bank credit may have adverse effects on the equities as debt calls new debt. Moreover, there are doubts that financing deficit could explain net debt, and therefore; net equity is found relatively significant in the issue denying the pecking order theory (Frank and Goyal, 2003). On the other hand, better liquidity is found as an asset on the way for new bank credit, unless it is accumulated under tougher financial circumstances (Coyle, 2000a; Coyle, 2000b; Steyn et al., 2002; Sohn and Kim, 2013; Dasgupta et al., 2014; Keefe and Yaghoubi, 2016; Apak et al., 2016). This study, however, investigates the impact on the equities. The nature of cash as a liquidity indicator appear to serve the short-run and it may not refer to the long-run (Pinkowitz et al., 2016), nonetheless, the study tries to examine whether this statement is valid for the broader framework of liquidity as CR and ATR. A limited set of indicators may help much in the financial analysis of the firms which are both in the agriculture sector (Novak et al., 2002) and all other sectors (Pindado and Rodrigues, 2004). Nevertheless, in terms of liquidity, agriculture sector has had an enhanced performance in the long-run among other industries in Turkey (Acikgoz et al., 2016; Acikgoz et al., 2018). The findings of the study clarify the discussion.

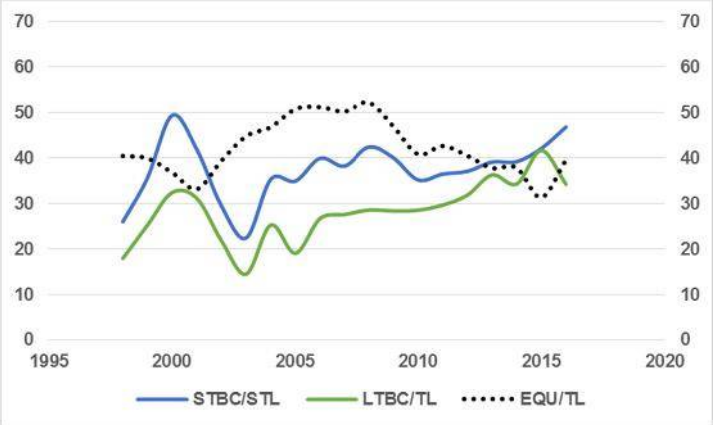

Figure 1. STBC/STL and LTBC/TL vs. EQU/TL in percentages in agriculture sector-Turkey (1998 – 2016) Source: Calculations on CBRT data

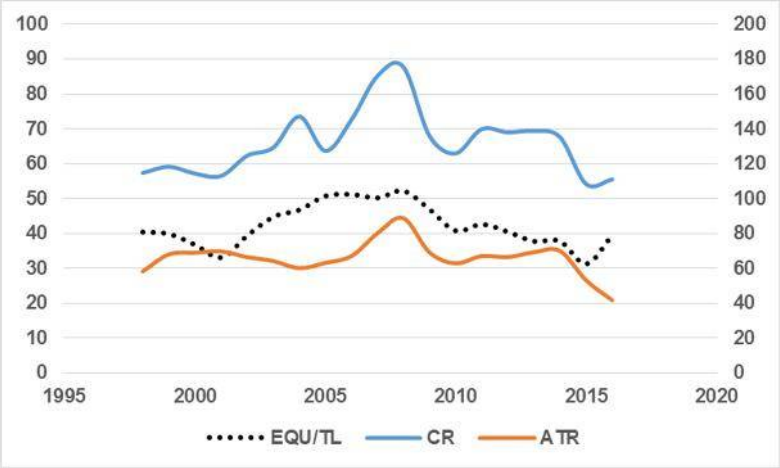

Figure 2. EQU/TL vs. CR and ATR in percentages in agriculture sector-Turkey (1998 – 2016) Source: Calculations on CBRT data

It can be noticed that the less the firms of the agriculture sector use bank credit the more they could accumulate equities in Figure 1 which depicts the long-term outlook of the equities in the agriculture sector versus bank credits of both the short and the long term.

Table 1. Selected data in the agriculture sector-Turkey (1998 – 2016)

As a percentage of STL	Minimum	Year	Maximum	Year	Average
CR	108.35	2015	175.53	2008	132.27
ATR	73.64	2016	88.84	2008	66.07
STBC/STL	22.47	2003	49.40	2000	37.49
LTBC/TL	14.53	2003	41.69	2015	28.19
EQU/TL	31.26	2015	52.19	2008	42.23

Source: Calculations of the authors on CBRT data for last three years' averages. Note that EQU/TL and the liquidity indicators CR and ATR are at their maximums in 2008. Nonetheless, CR and EQU/TL are at their minimums in 2015; however, ATR is in 2016 with one lag.

Table 2. Correlations of the variables

Variables	CR	ATR	STBC/STL	LTBC/TL
ATR	0.733**			
	0.000			
STBC/STL	0,006	0.042		
	0.980	0.865		
LTBC/TL	- 0.088	-0.093	0.784**	
	0.722	0.706	0.000	
EQU/TL	0.750**	0.426	- 0.177	- 0.520*
	0.000	0.069	0.469	0.022

*. Pearson correlations, 0.05 significance (2-tailed). **. 0.01 significance (2-tailed).
The study uses 57 observations as three years' averages (19 x 3) and N=19 for each variable.

Table 3. Covariance matrix

Variables	CR	ATR	STBC/STL	LTBC/TL	EQU/TL	C&CER
CR	346.352	131.093	0.737	- 10.857	85.043	117.722

ATR	131.093	92.315	2.598	- 5.929	24.932	77.986
STBC/STL	0.737	2.598	42.042	33.895	- 6.982	13.532
LTBC/TL	- 10.857	- 5.929	33.895	44.403	- 21.112	1.420
EQU/TL	85.043	24.932	- 6.982	- 21.112	37.121	22.486
C&CER	117.722	77.986	13.532	1.420	22.486	82.246

Inter-item covariance matrix. Note that the study excludes C&CER in the model.

We have also noticed that the equities of the agriculture sector have been fluctuating in relation and within the indicators of liquidity framework in Figure 2 which reveals the long-term outlook of the equities in the agriculture sector versus the famous liquidity indicators as current ratio and acid-test ratio. Table 1, 2, and 3 below give the descriptive characteristics, correlations and covariance of the variables respectively.

Table 4. Summaries of the model

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.956[a]	0.914	0.890	2.02009	1.822

[a]. Predictors: (Constant), CR, ATR, STBC/STL, and LTBC/TL. EQU/TL is the dependent variable and the independent variables are CR, ATR, STBC/STL, and LTBC/TL for the model.

Table 4, 5, 6, and 7 summarize the significant results of the regression run for the model below. Table 9 confirms the assumptions of the regression in terms of serial correlation, heteroscedasticity, and normality.

Table 5. Results of the model

Models	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	611.046	4	152.761	37.434	0.000**[a]
Residual	57.131	14	4.081		
Total	668.176	18			

[a]. ANOVA results, Predictors: (Constant), CR, ATR, STBC/STL, and LTBC/TL. EQU/TL is the dependent.
**. 0.01 significance.

Table 6. Coefficients of the model

	Unstandardized Coefficients		**Standardized Coefficients**	***t***	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
(Constant)	21.202	4.510		4.701	0.000		
CR	0.307	0.038	0.937	8.147	0.000	0.462	2.165
ATR	- 0.231	0.074	- 0.365	- 3.140	0.007	0.452	2.211
STBC/STL	0.496	0.121	0.528	4.113	0.001	0.371	2.694
LTBC/TL	- 0.810	0.118	- 0.886	- 6.882	0.000	0.369	2.711

Note that VIFs and tolerances are within the interval 0 to 5.

Table 7. Residuals statistics of the model

	Minimum	**Maximum**	**Mean**	**Std. Deviation**
Predicted Value	29.2639	52.3754	42.2338	5.82640
Residual	- 2.62960	3.25396	0.00000	1.78156
Std. Predicted Value	- 2.226	1.741	0.000	1.000
Std. Residual	- 1.302	1.611	0.000	0.882

Note that the means of residual, std. predicted value and std. residual are all zero.

Table 8. Collinearity diagnostics of the model

Dimension	Eigenvalue	Condition Index	Variance Proportions				
			(Constant)	CR	ATR	STBC/STL	LTBC/TL
1	4.922	1.000	0.00	0.00	0.00	0.00	0.00
2	0.057	9.313	0.00	0.03	0.03	0.02	0.15
3	0.009	23.741	0.73	0.09	0.12	0.06	0.28
4	0.007	26.321	0.23	0.03	0.07	0.82	0.51
5	0.005	31.647	0.04	0.85	0.78	0.09	0.06

Note that the condition index for the model are below 20 up to the third dimension.

Table 9. Tests confirming the assumptions

Test	Prob. *
Breusch and Godfrey Serial Correlation LM with Obs*R-squared Prob.Chi-Square(2)	0.5566
Breusch, Pagan and Godfrey Heteroscedasticity with Obs*R-squared Prob.Chi-Square(4)	0.2093
Jarque Bera Test: Prob.	0.5090

All tests confirm the assumptions of the regression for the model or no serial correlation, no heteroscedasticity, and normality for the model as p values > 0.05 (Breusch, 1978; Godfrey, 1978a; Breusch and Pagan, 1979; Godfrey, 1978b; Jarque and Bera, 1980; Jarque and Bera, 1987).

Table 10 reports the group unit root tests at level of first differences so as to confirm stationary variables. Table 11 determines the lag land criteria by the criterion at VAR. Table 12 confirms the presence of many cointegrating equations between the variables. Confirming the novelty of the study, Table 13 depicts the existence of Granger causality in the model for the liquidity indicator CR on EQU at lag 2 though the significance appears to be close to the limit.

Table 10. Group unit root tests at level of first differences.

Group of the Series	Method	Statistic	Prob.**	Cross-Sections	Obs
EQU/TL, CR, ATR, STBC/STL, and LTBC/TL	Null: Unit root (common)				
	Levin, Lin and Chu t	- 6.22679	0.0000	5	82
	Null: Unit root (individual)				
	Im, Pesaran and Shin W-stat	- 5.72528	0.0000	5	82
	ADF - Fisher Chi-square	47.5300	0.0000	5	82
	PP - Fisher Chi-square	47.4159	0.0000	5	85

** Fisher tests use an asymptotic Chi-square distribution, other tests assume asymptotic normality (Levin et al., 2002; Im et al., 2003; Dickey and Fuller, 1979; Fisher, 1932; Phillips and Perron, 1988). Sample: 1998-2016.: Individual effects for exogenous variables. Maximum lag. Automatic selection of lag length based on SIC: 0 to 2 with the selection of Newey-West automatic bandwidth and with Bartlett kernel.

Table 11. Lag selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	- 280.6224	NA	41741408	31.73582	31.98314*	31.76992
1	- 247.6999	43.89657*	19748033*	30.85555*	32.33950	31.06016*

* Lag order selected at VAR (Akaike, 1973; Akaike, 1974; Akaike 1979; Schwarz, 1978; Lutkepohl, 1991; Lutkepohl, 2004). Exogenous variables: C. Sample: 1998-2016. Included observations: 18. Sequentially modified LR test statistic at 0.05 level. Abbreviations are as follows; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; and HQ: Hannan-Quinn information criterion.

Table 12. Unrestricted cointegration rank tests for the group of the series

Hyp. No. of CE(s)[1]	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.985173	147.3145	69.81889	0.0000

At most 1 *	0.917806	75.72238	47.85613	0.0000
At most 2 *	0.791516	33.24493	29.79707	0.0193
At most 3	0.314610	6.590737	15.49471	0.6257
At most 4	0.009875	0.168704	3.841466	0.6813
Hyp. No. of CE(s)[2]	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.985173	71.59210	33.87687	0.0000
At most 1 *	0.917806	42.47745	27.58434	0.0003
At most 2 *	0.791516	26.65419	21.13162	0.0075
At most 3	0.314610	6.422032	14.26460	0.5597
At most 4	0.009875	0.168704	3.841466	0.6813

Group: EQU/TL, CR, ATR, STBC/STL, and LTBC/TL. Unrestricted Cointegration Rank Test: Trace[1] and Maximum Eigenvalue[2] (Johansen, 1988; Johansen, 1995; Pesaran and Shin, 1998). Sample (adjusted): 2000 2016. 17 observations after adjustments with the assumption of a linear deterministic trend. Lags (in first differences): 1 to 1. *. Rejection at 0.05 level. **. MacKinnon-Haug-Michelis (1999) p-values. Trace test and Max-eigenvalue test both indicate 3 cointegrating equations at 0.05 level.

Table 13. The significant result of pairwise Granger causality tests for the group of series.

Lag	**Null Hypothesis**	**Obs**	**F-Statistic**	**Prob.**
2	EQU does not Granger Cause CR	17	3.98729	0.0470

Reports the only significant result at 0.05 level for Pairwise Granger Causality Tests on the group of the series for Lag 2. Sample 1998–2016.

Figure 3 reports the selected stability diagnostics of CR in the model on EQU versus variables in leverage plots with fit lines in red as partial out variables with the evidence of LTBC as the control variable.

inally, Figure 4 gives evidence on the stability of the study as the result for the diagnostics of CUSUM of squares test for recursive estimates (OLS Only) which is found within the significance interval.

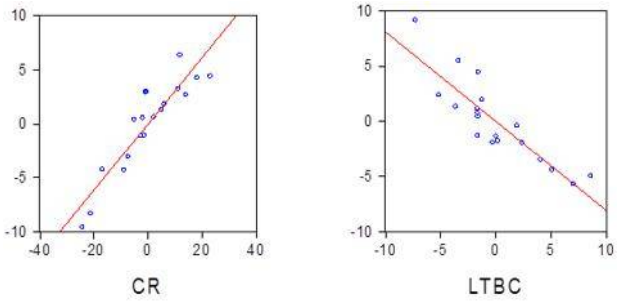

Figure 3. EQU/TL vs. CR and LTBC (partialled on regressors)

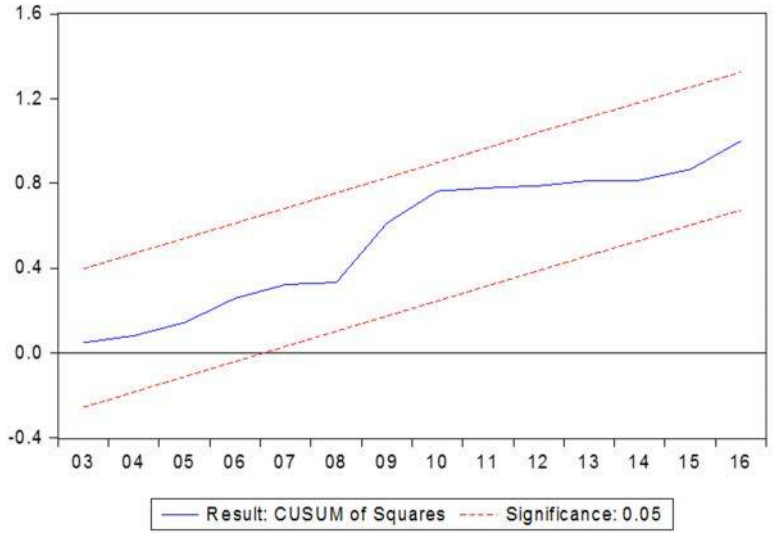

Figure 4. CUSUM of squares test result for recursive estimates (OLS only)

Conclusion

The study assumes that the agriculture sector in Turkey with the businesses therein has always been among the sensitive parts of the Turkish economy in which incentives and concessions are widely available. However, these precautions in terms of incentives and concessions do not keep track of the healthy liquidity levels or the limited dependence on bank credit.

The study confirms the existence of a long-run relation in liquidity indicators and equities along with the potential usage of bank credit in the very long run from 1998 and 2016 in terms of three years' averages of aggregate balance sheets in the agriculture sector. Here, the general linear regressions which the study runs have significant results. Current ratio and short-term bank credits positively affect the level of equities whereas acid-test ratio and long-term bank credit have negative impact. The study also confirms the stability of the results in a set of supplementary analysis on stability diagnostics including leverage plots and recursive estimation.

As the main conclusion of the study, we may notify that the level of equities in the agriculture sector is not only a function of either STBC or LTBC, but also a prediction on the first two famous liquidity indicators, CR and ATR. A more sustainable financing in the agriculture sector comes with healthy liquid assets and the limited bank credit contribution in the liabilities in the evidence of Turkey.

Our recommendation on policy implications of these findings therefore lead to the reconsideration and/or substitution of the present vision for incentives on easing the access to bank credit finance for the firms of agriculture sector with promoting the accumulation of equities and the limitation of financial credit by the help of a better liquidity attained.

Our study includes limitations on the variables selected in ratios and an empirical evidence that could be related to local circumstances. Nevertheless, the findings of the study will expectedly help policy makers and further and future studies not only on the sector studied but also other sectors. We also present our acknowledgements to the Central Bank of Turkey for the exquisite archive of real sector statistics with all the references cited in the study and listed below.

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