Equities and cash holdings:

a long-term analysis of Turkish construction firms

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Abstract

Being at the first sight bank credits have been implicit in leverage, and among the significant determinants of long-term returns along with cash for many sectors. However, equities could have been neglected in this perspective. A sustainable proportional level of equities with the help of a return variable may alter the expectations on bank credit effect, and in this context; this study aims to reveal whether there exists a set of identical determinants for cash holdings in the case of the Turkish construction sector. By assessing a set of aggregate data from the balance sheets of the businesses in this very sector, we have eliminated most of the variables and written two models in which an alternative return indicator is considered an extra independent to significantly presume cash and cash equivalents in the selected sector. We therefore conclude that both return on assets and return on equities could be used interchangeably. In the analysis, the essential variables are revealed as equities on assets and the ratio of bank credits in the short-term on current liabilities. The study also asserts robust results for both independent returns with the same set of predictors in which bank credits are not alone in a leading role, however, equities stand to be qualified as a sustainable contributor to liquidity as well.

Key words: Cash, equities, bank credits, returns on assets, returns on equities, construction sector.

Introduction

As the leading industry in Türkiye (Turkey) for an ongoing economic growth, the construction sector has always been correlated with the bank credit usage not only for the consumers but also for the producers therein. Macroeconomic indicators such as interest rates, economic growth, and inflation and their causalities could have obvious effects on the construction sector of any country. However, this study offers a novel approach which welcomes a set of identical determinants in order to ease the assessment and comparison on returns no matter where their origin is from assets or equities for a given sector or a business in terms of liquidity in micro level. Moreover, the construction sector is cited among the sectors which are at risk in changing macroeconomic conditions.

The study aims a long-term financial analysis for a set of selected variables of the construction sector in Turkey. The study reports and analyses some selected indicators along with its methodology in the context of long-term assessments. In the very long-term and for the sustainability assessing purposes, the study therefore restates the scene in the evidence of Turkey. The results are assessed on data of yearly percentage changes of the construction sector in Turkey. As the sector has a fragile structure amid the long-term high external liability or dependency to bank credit, the terms of liquidity are always on the spot. This study, however, deals with the equities of the businesses in the construction sector so as to explore the dependency of cash holdings on equities in the long run and to feed policy implications and various suggestions. The study first tested all of the potential variables in the predictions of cash holdings in the long-run by either returns on assets or on equities in its draft version. Thereafter, it concludes the set as equities, short-term bank credit usage, and each type of returns respectfully to significantly predict cash for which the role of equities is not surprising for the returns on equities but it appears that it is eventually more significant in terms of the returns on assets among those identical variables. Nevertheless, sustainability in the construction sector is also considered with a link to wealth which is formed by capital investment of the savings and any business or sector would actually better to save revenues to cope with the depreciation in its assets by time [1]. Thus, equities are the very place where the savings of the businesses accumulates. Yet as a source of sustainability for liquidity in its most liquid form as cash, a sustainable level of equities is therefore found as a significant, long-term, and reliable indicator. Thus, the study redirects the focus from bank credits to the equities by asserting a set of identical variables, which do have significant effects as determinants of cash holdings within the construction sector in Turkey as a sign of long-term evidence.

Debt or equity is among the oldest questions in corporate finance [2,3] and more returns or profit decreases leverage [4] along the way to reach an optimal capital [5] or structure [6]. Liquidity in terms of cash on the other hand, is vital for any business not only to feed everyday operations but also to sustain an affirmative future credit worthiness and an increasing value of the firm [7,8,9,10,11]. Nonetheless, a sector may have its own dynamics in terms of sector specific, country specific, and macro-economic circumstances and so does the construction sector in Turkey [12,13]. Yet equities might have significant facets not only by the bank credit usage but also by the liquidity in a sector as well [14]. A recent study has very well demonstrated the reasons of leverage in the short run by debt, liquidity, size, and returns using advanced methodologies in the case of construction sector in the Republic of Serbia [15]. What if we concentrate on equities side of the coin and use cash holdings as the dependent along with equities, short-term bank credit and both types of returns as the latter is interchangeably added? This study has hereby stated its models which tries to depict that the cash of the future is a function of equities, bank credit in the short run and returns either on equities themselves or on assets. Depending on the subtitle, financial liquidity may itself negatively affect profitability as in the evidence of the construction sector in Poland [16], we thereafter provide both type of returns as substitutes among alternative models which are designed to explore long-term and/or lagging effects of selected independent variables on cash holdings in the construction sector in Turkey.

Methodology

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The study reveals the long evidence in the construction sector in Turkey. By taking into consideration the data on the sector, the study uses statistics after a similar methodology as calculated in [13] on the same raw data provided by the Central Bank of the Republic of Turkey (CBRT) for the real sector from 1998 to 2016 in terms of three-year sectoral averages of aggregate balance sheet totals [17] in Turkey. The data set consists of 889 firms in various scales in averages for each year in the assessed period from the construction sector's consolidated balance sheet totals. Thereafter, the comparative calculations on the data [18,19,20] could supply the study with the ratios or selected variables which are presented in the figures and which are run in the statistical methodology as well. The set of variables used for the study are as follows along with their abbreviations:

Cash and Cash Equivalents (C&CE) is calculated as a percentage in current liabilities.
Equities (EQU) stands for shareholders' equity as a percentage in total assets.
Short-Term Bank Credit (STBC) including capital and interests of long-term bank credit for one year and it is taken into consideration as a percentage in current liabilities.
Returns On Equities (ROE) is the net profit as a percentage in shareholders' equities.
Returns On Assets (ROA) is the net profit as a percentage in total assets.

The study designs two regressive models in the Model A, the equation (1):

$$Y_{C\&CE\,it} = \beta_0 + \beta_{1a} x_{EQU\,it} + \beta_{2a} x_{STBC\,it} + \beta_{3a} x_{ROE\,it} + \varepsilon_{it} \qquad \textbf{(1)}$$

And in the Model B, the equation (2):

$$Y_{C\&CE\,it} = \beta_0 + \beta_{1a} x_{EQU\,it} + \beta_{2a} x_{STBC\,it} + \beta_{3a} x_{ROA\,it} + \varepsilon_{it} \qquad \textbf{(2)}$$

For the LS (NLS & ARMA or ANOVA) method in the models [21,22,23,24,25,26,27], the study ensures autocorrelation, normality, and heteroscedasticity assumptions along with collinearity assumptions on the level [28,29,30,31,32,33].

The results of the models are further analyzed with the variables both at the level and at the first differences, thus, we have run Phillips-Perron tests for unit root along with group common unit root [34,25,35,36,37] as well as tests for Granger causalities, we have then run single equation and Johansen cointegration tests as the series are determined as I(1) stationary series so as to detect linear and quadratic cointegrations in the models [38,39,40,41,42,43,44,45,46,47,48,49,50,51].

Result & Discussion

Figure 1 depicts the long-term appearance of the expected relation of C&CE and STBC for the construction sector in Turkey particularly after 2006. Nevertheless, Figure 2 affirms relatively sustainable contribution of EQU along with ROE and ROA on C&CE.

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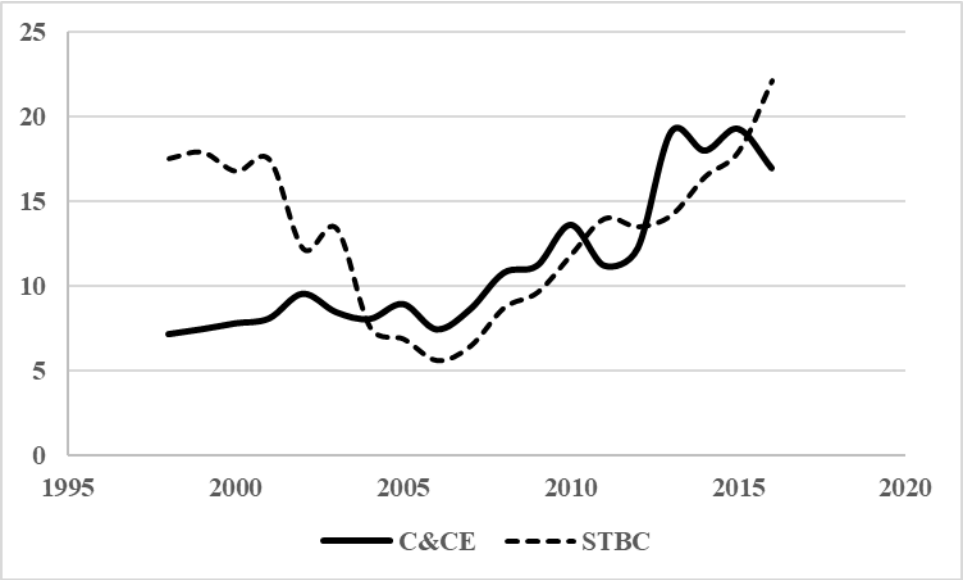

Fig. 1. C&CE and STBC in construction sector in Turkey (1998 – 2016)
Source: [13] & calculations on CBRT data.

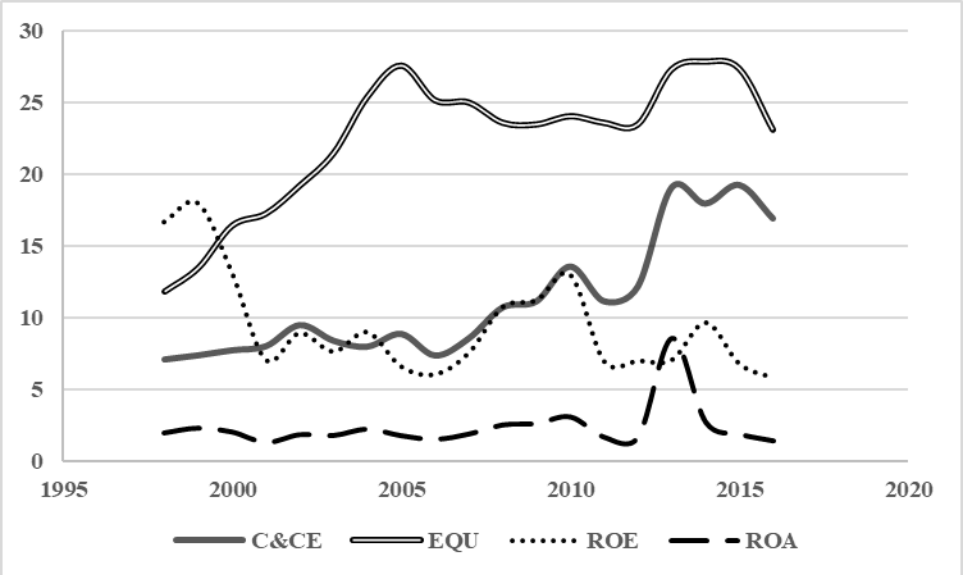

Fig. 2. EQU, ROE, and ROA for C&CE in construction sector in Turkey (1998 – 2016)
Source: [13] & calculations on CBRT data.

Table 1. Tested regressions of Model A and B

Model	Dependent	Independents	Adj. R Square	DW	Sign.
A	C&CE	EQU, STBC, and ROE	0.87	1.90	0.000**
B	C&CE	EQU, STBC, and ROA	0.90	1.65	0.000**

**. 0.01 significance. Method LS or ANOVA.

Table 1 denotes that both models have significant summaries for the same components except type of returns used as the last independent. Thereafter we have preferred revealing the aspects the models A and B as all variables offer proof on their predicting quality (Table 2 and Table 3). Summaries of the models designed for the study are presented below:

Table 2. Model A in summary

Regression	**R Square**	**Adjusted R Square**	**Durbin-Watson**	**Significance**
C&CE (Dependent)	0.89	0.87	1.90	0.000**
Independents	**Coefficients**	**Prob.**	**Coefficient Variance**	**Centered VIFs**
C	-23.98445	0.0000	17.14097	
EQU	1.003241	0.0000	0.013143	2.352174
STBC	0.730248	0.0000	0.007091	1.253929
ROE	0.327335	0.0347	0.019876	2.007504

ANOVA or LS results. **. 0.01 significance. Note that VIFs are lower than 5.

Table 3. Model B in summary

Regression	**R Square**	**Adjusted R Square**	**Durbin-Watson**	**Significance**
C&CE (Dependent)	0.91	0.90	1.65	0.000**
Independents	**Coefficients**	**Prob.**	**Coefficient Variance**	**Centered VIFs**
C	-15.88868	0.0000	5.251691	
EQU	0.742624	0.0000	0.006026	1.358675
STBC	0.671593	0.0000	0.005643	1.257074
ROA	0.684306	0.0052	0.043816	1.101525

ANOVA or LS results. **. 0.01 significance. Note that VIFs are lower than 5.

Table 4. Model A: Assumptions on serial correlation, heteroscedasticity, and normality

Test	Prob. *
Breusch-Godfrey Serial Correlation LM Test	0.4940
Breusch-Pagan-Godfrey Heteroscedasticity Test	0.8730
Jarque Bera Test	0.6636

p values > 0.05 assuring serial correlation (Obs*R-squared Prob. Chi-Square (2)), heteroscedasticity (Obs*R-squared Prob. Chi-Square (3)), or normality (Prob.) assumptions [28,30,29,31,32,33].

Table 5. Model B: Assumptions on serial correlation, heteroscedasticity, and normality

Test	Prob. *
Breusch-Godfrey Serial Correlation LM Test	0.7606
Breusch-Pagan-Godfrey Heteroscedasticity Test	0.7442
Jarque Bera Test	0.4659

p values > 0.05 assuring serial correlation (Obs*R-squared Prob. Chi-Square (2)), heteroscedasticity (Obs*R-squared Prob. Chi-Square (3)), or normality (Prob.) assumptions [28,30,29,31,32,33].

All tests assure basic assumptions of the regressive models (Table 4 and Table 5).

The variables of the study at their first differences have affirmative results in the unit root checks for stationary series except only common group unit root tests for individual intercept and for individual linear trends level, however they were affirmative and acceptable at both

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none and individual intercept levels in all group unit root tests confirming the assumptions on stationary series as the series of the models has no individual unit root and they are stationary (Table 6 and Table 7).

Table 6. Unit root tests for the series

Series	Level		First differences	
	t-Statistic	Prob. *	t-Statistic	Prob. *
C&CE	1.471055	0.9590	-4.581367	0.0001
EQU	0.591904	0.8347	-2.143767	0.0344
STBC	0.008814	0.6724	-3.700729	0.0010
ROE	-1.727509	0.0795	-4.108384	0.0004
ROA	-1.582172	0.1046	-13.90098	0.0001

Null: Series has a unit root. Phillips-Perron unit root test results [37]. Level and first differences for critical values and results [34]. Exogenous: None. Bandwidth (Newey-West automatic, using Bartlet Kernel). *[46] one-sided p-values. Sample size of 18 to 17 therefore probabilities and critical values may not be accurate.

We then follow cointegration tests unrestrictedly in terms of ranks for the models in Table 8 and Table 9 respectively.

Table 7. Group unit root tests

Group	Method	Statistic	Prob.**	Cross-sections	Obs.
None	Null: Unit root (common)				
	Levin, Lin and Chu t	-5.80824	0.0000	5	82
	Null: Unit root (individual)				
	ADF - Fisher Chi-square	58.9917	0.0000	5	82
	PP - Fisher Chi-square	73.1010	0.0000	5	85
Individual intercept	Null: Unit root (common)				
	Levin, Lin and Chu t	-2.96554	0.0015	5	82
	Null: Unit root (individual)				
	Im, Pesaran and Shin W-stat	-4.11299	0.0000	5	82
	ADF - Fisher Chi-square	37.9000	0.0000	5	82
	PP - Fisher Chi-square	128.548	0.0000	5	85
Individual intercept and trend	Null: Unit root (common)				
	Levin, Lin and Chu t	-0.35820	0.3601	5	76
	Breitung t-stat	-0.46506	0.3209	5	71
	Null: Unit root (individual)				
	Im, Pesaran and Shin W-stat	-4.16910	0.0000	5	76
	ADF - Fisher Chi-square	35.8052	0.0001	5	76
	PP - Fisher Chi-square	58.3701	0.0000	5	85

Variables as a group: First differences of C&CE, EQU, STBC, ROE, and ROA. **Asymptotic Chi-square distribution in Fisher tests, asymptotic normality in all other tests [36,35,34,25,37,52]. Max lag; Auto lag length: SIC: 0 to 2 at none and individual effects and 0 to 3 at individual effects and individual linear trends. Newey-West automatic bandwidth and kernel at Bartlett [50,53,54,55,56].

Table 10 reports all significant Granger causalities at lags 1 to 5 confirming the importance of equities as a Granger cause for cash and cash equivalents in both models with the most robust and identical results. Table 10 also denotes equities as the most robust variable confirming the importance of all variables used in the models.

Table 8. Cointegration rank tests in Model A

Hyp. No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.821560	70.04905	47.85613	0.0001
At most 1 *	0.765643	40.74953	29.79707	0.0019
At most 2 *	0.603216	16.08405	15.49471	0.0407
At most 3	0.021522	0.369875	3.841466	0.5431
Hyp. No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.821560	29.29952	27.58434	0.0298
At most 1 *	0.765643	24.66549	21.13162	0.0152
At most 2 *	0.603216	15.71417	14.26460	0.0293
At most 3	0.021522	0.369875	3.841466	0.5431

*rejection 0.05 level. **[47] p-values. Group: C&CE, EQU, STBC, and ROE. Unrestricted Cointegration Rank Test: Trace and Maximum Eigenvalue [42,43,48]. Lags (in first differences): 1 to 1. Adjusted sample: 2000-2016. 17 observations. Linear deterministic trend. All tests indicate 3 cointegrating equations.

Table 9. Cointegration rank tests in Model B

Hyp. No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.954086	80.73604	47.85613	0.0000
At most 1	0.720351	28.35927	29.79707	0.0725
At most 2	0.322562	6.697500	15.49471	0.6131
At most 3	0.004524	0.077078	3.841466	0.7813
Hyp. No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.954086	52.37677	27.58434	0.0000
At most 1 *	0.720351	21.66177	21.13162	0.0421
At most 2	0.322562	6.620422	14.26460	0.5350
At most 3	0.004524	0.077078	3.841466	0.7813

*rejection 0.05 level. **[47] p-values. Group: C&CE, EQU, STBC, and ROA. Unrestricted Cointegration Rank Test: Trace and Maximum Eigenvalue [42,43,48]. Lags (in first differences): 1 to 1. Adjusted sample: 2000-2016. 17 observations. Linear deterministic trend. Trace tests indicate 1 and Max-eigenvalue tests indicate 2 cointegrating equations.

Table 10. Significant causalities

Model	**At lag**	**Null**	**Obs.**	**F-Statistic**	**Prob.**
A, B	1	C&CE does not Granger Cause STBC	18	9.06412	0.0088
A, B	2	C&CE does not Granger Cause STBC	17	5.24205	0.0231
A	2	ROE does not Granger Cause EQU	17	3.26685	0.0737
A	3	EQU does not Granger Cause ROE	16	3.61006	0.0585
A, B	4	C&CE does not Granger Cause STBC	15	6.22156	0.0251
A, B	4	EQU does not Granger Cause STBC	15	3.22415	0.0976
A, B	5	EQU does not Granger Cause C&CE	14	40.7710	0.0059
A	5	EQU does not Granger Cause ROE	14	9.45548	0.0077
A	5	ROE does not Granger Cause STBC	14	12.3133	0.0326
B	3	C&CE does not Granger Cause STBC	16	3.14599	0.0794
B	3	C&CE does not Granger Cause ROA	16	4.83156	0.0285
B	3	ROA does not Granger Cause STBC	16	3.38417	0.0677
B	4	ROA does not Granger Cause STBC	15	6.15752	0.0256
B	5	C&CE does not Granger Cause ROA	14	30.6572	0.0089
B	5	STBC does not Granger Cause ROA	14	11.6288	0.0353

Significant pairwise results of Granger causalities only [40] in Model A and Model B at lags 1-5 at 0.01, 0.05, and 0.10 significance levels.

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We further design a group consisting of all variables or adding ROA into the Model A for assessing single equation cointegration existence while taking each variable into consideration in each group or model as dependent so as to explore stochastic trends (Table 11).

Table 11. Single-equation cointegration tests

Group	Specification	**Lag**	**Dependent**	**tau-statistic**	**Prob.***	**z-statistic**	**Prob.***
Model A	Linear Trend	0	C&CE	-4.762313	0.1042	-20.78819	0.0853
	Linear Trend	1	EQU	-4.115670	0.2417	-36.42494	0.0001
	Quadratic Trend	1	EQU	-4.150837	0.3799	-36.95107	0.0000
	Quadratic Trend	1	ROE	-4.815406	0.1922	-43.15215	0.0000
Model B	Constant	0	ROA	-4.259732	0.1047	-18.76241	0.0856
Model (A + B)	None	0	ROA	-4.410574	0.0801	-19.47960	0.0662
	Constant	1	EQU	-4.401267	0.1618	-40.59402	0.0000
	Linear Trend	1	EQU	-4.313446	0.2938	-39.04149	0.0001
	Linear Trend	1	ROE	-5.147741	0.1142	-45.56871	0.0001
	Quadratic Trend	1	EQU	-4.269939	0.4520	-38.29752	0.0000
	Quadratic Trend	1	ROE	-4.983292	0.2348	-45.09637	0.0000

Significant results only. Null: Series are not cointegrated. Groups at level. *[46] p-values. Automatic lags: Schwarz criterion (max. lag=3). Adjusted sample: 1999-2016. 19 observations after adjustments. Both Model A and B have 4 stochastic trends in asymptotic distribution, however the integrated Model (A+B) or after adding ROA variable to Model B variables as a group the results affirm 5 stochastic trends in asymptotic distribution [50,39].

Conclusions

The study fundamentally reveals that returns on assets has more significant effect than returns on equities on cash holdings of the construction sector in Turkey. Yet the accumulation of equities as a level is found as a sustainable predictor for the cash level in the long-run. Model A of the study, that is equities, short term bank credit and returns on equities for the dependent variable cash and cash equivalents asserts more stability and cointegration. The study also determined a set of linear and quadratic trends in terms of equities and returns on equities. Granger causality results, on the other hand, depicts the causalities from returns on equities on cash and cash equivalents along with many significant causalities among the variables of the study where cash holdings Granger cause both short-term bank credits and returns on assets. Therefore, the most reliable variable is the level of equities in the models which are hereby represented in the evidence of the construction sector and its firms in Turkey.

Consequently, we suggest to have a solid and/or a rather the higher the better level of equities for the construction sector in order to reach a sustainable level in terms of cash holdings and to have a better liquidity in the nature of sectoral evidence of construction firms in Turkey. In fact, the level of equities is the most reliable among the variables of the study not only for the regressive models but also in the cointegrations and causalities.

Yet, as a source of qualified liquidity, cash holdings require a sustainable level of equities as it is a significant and reliable indicator in the very long-term. Thus, we have transmitted the focus from bank credits in the long-run to the equities by asserting a set of identical variables for the construction sector in Turkey.

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We believe that these above given findings and conclusions along with the represented models shall be used for the other sectors in Turkey or in other countries as a future study potential. Hence the study has limitations for its local secondary data in terms of sectoral averages and because of ratio analysis used on a sectoral basis.

Nevertheless, any policy implications for this very sector would better conclude decisions and incentives on the level of equities held. As considered with its dependency on bank credit, the construction sector in Turkey would therefore have a healthier net liquidity in terms of cash holdings if only it concentrates not only on short-term bank credits but also on equities along with their returns. The significance, cointegration and causalities reported in this study would therefore help much for the construction sector in Turkey so as to attain a level of restored and sustainable liquidity in the future.

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