

Studying the Relationship between Liquidity Indices (traditional and modern) and the Profitability of Companies Listed in Tehran Stock Exchange

Farzaneh Nassirzadeh

Ferdowsi University of Mashhad
Faculty of Econ.&Business Admin
Department of Accounting
Azadi Squ.,Mashhad,Iran
Office tel.:(0098511)88-13-091
E-mail: fnasir10@yahoo.com

Amin Rostami

Accounting MA, Ferdowsi University of Mashhad
E-mail: amin.rostami7@gmail.com

Abstract

The purpose of this research is to study the relationship between traditional and modern indices of liquidity with profitability of companies. Additionally the correlation between these indices is also studied. Traditional liquidity indices include current ratio and liquid ratio and modern liquidity indices include comprehensive liquidity index, cash conversion cycle index and net liquidity balance index. To evaluate the profitability it has been used the ratio of return on assets, the ratio of return on equity and the ratio of net profit margin. In this regard, 5 hypotheses were codified and multi variable regression and panel data were used.

The research findings show that there is a correlation between traditional and modern indices of liquidity but this correlation is weak suggesting that the information content of these ratios are different. Thus it is recommended to use modern indices as complement. Also hypotheses testing indicated that there is a significant relationship between all traditional and modern indices of liquidity and profitability.

Key words: modern liquidity indices, comprehensive liquidity indices, cash conversion cycle index, net liquidity balance index, traditional liquidity indices, and profitability.

JEL Category: G3 9; G33

1- Introduction

Profitability and liquidity are of important issues that management of each commercial unit should take studying and thinking about them in to account as their most important duties. Some thinkers believe that liquidity has more importance because companies with low profitability or even without profitability can serve economy more than companies without liquidity (Biterback, 2002). The importance of liquidity status for investors and managers for evaluating company future, estimating investing risk and return and stock price in one hand and the necessity of removing weaknesses and defects of traditional liquidity indices (current and liquid ratio) on the other hand persuade the financial researchers (Melyk, Birita 1974; Richard and Laghline, 1980; Shalman and Cox, 1985) to present modern liquidity indices by applying some adjustment in current and liquid ratios. (khoshtinat and Namazi, 2004). Modern indices take the weaknesses of traditional liquidity indices including not considering the liquidity level of current assets,

repayment time of current liabilities and not considering the combination of inventory into account.

In this study the relationship between liquidity status and companies profitability is studied and correlation between modern and traditional liquidity indices is also tested.

2- Theoretical basics

2-1. liquidity indices

Researchers have presented different indices to measure company liquidity being dealt with to study the traditional and modern liquidity indices in following.

Traditional liquidity indices:

Traditional liquidity indices focus on this issue that company liquidity status is more desirable when current assets are more than current liabilities. In other words, current assets regardless of its combination represent company cash needs. Hence current and liquid ratios have been introduced to measure liquidity status (Kamath, 1989; Lyroudi and Mc Carty, 1992; Moss and Stine, 1993). The main problem of these indices is that it doesn't figure on how liquid the current assets are and how rapid the current liabilities are repaid.

Modern liquidity indices

Modern liquidity indices having been studied are: comprehensive liquidity index, cash conversion cycle index, net liquidity balance index.

Comprehensive liquidity index: this index solves the problem related to not considering the liquidity degree of current assets and time to repay the current liabilities. The details of this model are as following (Melyk and Birita, 1974):

1. Specific weight is assigned to each current asset considering their liquidity degree and their adjusted amount is calculated. Weight of each asset is one minus asset reverse rotation.
2. Coefficient one is assigned to cash and short – term investments (because of high liquidity strength) and doesn't need to be adjusted.
3. Since accounts receivable has one step to get cash, they are adjusted as following:

$$R = R * [1 - (1 / TR)]$$

Where AR is Adjusted Accounts Receivable, R is the average of accounts receivable and TR is Turnover Accounts Receivable.

4. Because it should be firstly converted to accounts receivable and then converted to cash inventories are adjusted as following:

$$AINV = INV * [1 - (1 / TR) - (1 / TINV)]$$

Where AINV is adjusted Inventory, INV is average of inventory and TINV is turnover of inventory.

5. Calculation adjustment coefficient and its adjusted amount are calculated for each current liability. Accounts payable are adjusted as following:

$$AP = AP * [1 - (1 / TAP)]$$

$$TAP = PUR / AP$$

Where AAP is Adjusted Accounts Payable, PUR is total of purchase, AP is average of Accounts payable and TAP is turnover of Accounts Payable. Also other components of liabilities can be adjusted by same method.

6. Comprehensive liquidity index is calculated as following:

$$ACL = ACA / CLI$$

Where CLI is Comprehensive Liquidity Index, ACA is Adjusted Current Asset and ACL is Adjusted Current Liability.

Liquidity degree of current assets and repayment time of current liabilities is considered in this ratio.

Cash conversion cycle index: Gitman (1974) has mentioned cash conversion cycle as critical component of working capital management. This index is interval between paying

liabilities and receiving cash from collecting receivables. The company has better liquidity if this interval is shorter. Cash conversion cycle index is calculated by following formula (Gitman, 1974):

$$CCC = OC - PP$$

Where CCC is Cash Conversion Cycle, OC is Operating Cycle and PP is accounts Payables Period.

Operation period is also calculated as following:

$$OC = INVP + RP$$

Where PR is Receivables Conversion Period and INVP is Inventory Holding Period.

Accounts receivable period is calculated as following:

$$PP = AP / DCOGS$$

Where AP is Average of Accounts Payable and DCOGS is daily costs of goods sold (COGS/360).

Net liquid balance index: in this index it is figured on cash balance and securities to show company liquidity status. This index shows company real cash saving related to unexpected needs. Net liquid balance is calculated as following (Shalman and Cox, 1985):

$$NLB = (CASH + STI - AP) / TA$$

Where NLB is net liquid balance, CASH is cash, STI is short- term investment, AP is accounts payable and TA is total of asset.

2-2: profitability indices

Profitability is of important information in economic decision makings and it has been always used by investors, managers and financial analyzers as guide of dividend payment, tool for measuring management efficiency and instrument for predicting and evaluating decision makings (Saghafi and Aghayie, 1994). Assets return ratio, equities return ratio and net profit margin ratio is used in this research to evaluate profitability because there is a direct relationship between these ratios and company strategy and management performance.

Studied ratios are as following:

Return on Assets ratio = net profit / total assets

Return on Equity ratio = net profit / total of equity

Net profit margin ratio = net profit / net sales

Control variables have been also used in this research that are:

- 1- Financial leverage: it is measured by total liabilities ratio to book value of total assets. It has been used in Namazi and Ebrahimi (2009)'s research as control variable.
- 2- Company size: of total assets logarithm is used to compute it and this criteria has been used in researches such as Rezazade and Heidarian (2010), Aljeli (2004), Nazir and Afza (2009), Sharma and Kumar (2011) as control variable.
- 3- Industry: considering that categorizing of industry has a significant effect on financial ratios it is entered in model as a figurative variable with zero and one values. Noravesh and Heidari (2004), Namazi and Rostami (2006) and Nazir and Afra (2009) have considered the industry type in their research as control variable.

3- Review of research background

Lairodi and et.al (1999) studied in a research the relation between liquidity and leverage ratios and profitability in companies of London Stock Exchange in period of 1993-1997. The results of their research showed that cash conversion cycle, current ratio and liquid ratio have a negative and significant relationship with profitability ratios including net profit margin ratio, assets return ratio and equities return ratio. Also, there is a positive and significant relationship between cash conversion cycle and current and liquid ratios and accordingly the increase of current and liquid ratios must not be assumed as improved liquidity status since simultaneous increase of cash conversion cycle suggest that liquidity status become worse.

Liarodi and Lazaridis (2000) studied in a research the relationship between liquidity and leverage ratios and profitability for 82 companies of Food Industry of Greece Stock Exchange in 1997 and found that there is a positive and significant relationship between cash conversion cycle and assets return ratio. Also, there is a positive and significant relationship between cash conversion cycle and current and liquid ratios.

Wang (2002) studied the relationship between liquidity management and company profitability and value for Japanese and Taiwanese companies in period of 1985-1996. The results of his research showed that there is a negative and significant relationship between cash conversion cycle and profitability indices (equities return ratio and assets return ratio). Additionally, brave liquidity management occurring by decreasing cash conversion cycle results in improved company performance and accordingly increased company value.

Eljelly (2004) studied in a research the relationship between liquidity and profitability for 29 corporations of Saudi Arabia in period of 1996-2000 and found that there is a negative and significant relationship between profitability and companies liquidity level having being measured by current ratio and cash conversion cycle.

Khoshtinat and Namazi (2004) investigated the correlation between traditional and modern liquidity indices of Food Industry companies of Tehran Stock Exchange from 1996 through 2000. The results of their research showed that although there is a close correlation between modern liquidity indices and traditional liquidity indices, but there are also some differences that can play an important role in decision making. Also, modern liquidity indices have more different information content and can help users of these indices to make optimal decisions.

Namazi and Mansouri (2006) studied in a research entitled “Empirical Study of Cash Conversion Cycle and Analysis of Tehran Stock Exchange Companies Liquidity” cash conversion cycle as liquidity index in 216 companies and in period of 1998-2002 and found that there is a positive and significant relationship between cash conversion cycle and current ratios but there isn't any significant relationship between cash conversion cycle and liquid ratios; cash conversion cycle has a negative and significant relationship with net profit to sales ratio and equities return ratio. It wasn't observed any significant relationship between cash conversion cycle and assets return ratio.

Studying the relationship between working capital management, company performance and profitability of 131 companies listed in Athens Stock Exchange in period of 2001-2004 Lazaridis and Tryfonidis (2006) concluded that there is a significant relationship between profitability (assets return) and cash conversion cycle.

Nobanee and Alhajjar (2009) studied the relationship between working capital management, company performance and activation of cash flow in period of 1990-2004.

The results of their research showed that managers can increase their company profitability and cash flow through decreasing cash conversion cycle and collection period of accounts receivable. Also, decreased cash conversion cycle and prolonged maturity date of accounts payable results in decreased company profitability and cash flow.

Uyar (2009) examined in a research the relationship between cash conversion cycle and company profitability and size and found that there is a negative and significant relationship between cash conversion cycle and assets return ratio but there isn't any correlation between cash conversion cycle and equities return ratio. Also, companies with short cash conversion cycle have more profitability than companies with long cash conversion cycle.

Rezazadeh and Heidarian (2010) studied in a research entitled "The Effect of Working Capital Management on Iranian Companies Profitability" an example of companies listed in Tehran Stock Exchange from 1999 through 2008 and found that management can value up for company through decreased inventories amount and days of receivables collection period. Additionally, companies profitability can also be improved by shortening the cash conversion cycle.

Sharma and Kumar (2011) concluded that there is no significant relationship between cash conversion cycle and profitability (assets return) through studying the relationship between working capital management and profitability.

4- Methodology

4-1. research hypotheses and purposes

The main purpose of this research is to study the relationship between traditional and modern liquidity ratios and profitability of companies accepted in Tehran Stock Exchange. In order to evaluate the profitability Return of Assets (ROA), Return on Equity (ROE) and Net Profit Margin (NPM) have been used separately. In addition the extent of correlation between traditional and modern liquidity indices was also studied.

To study the relationship between traditional liquidity ratios and profitability following hypotheses were designed:

Hypothesis 1- there is a significant relationship between current ratio and profitability.

Hypothesis 2- there is a significant relationship between liquid ratio and profitability.

To study the relationship between modern liquidity ratios and profitability following hypotheses were designed:

Hypothesis 3- there is a significant relationship between comprehensive liquidity index and profitability.

Hypothesis 4- there is a significant relationship between cash conversion cycle and profitability.

Hypothesis 5- there is a significant relationship between net liquid balance and profitability.

4-2. statistical society and sample

The statistical society of this research includes all companies accepted in stock exchange during the nine- year period of 2002-2010. Random sampling has been used in this research and studied companies were selected by elimination method and following criteria and eventually ended to 108 companies of 5 different industries.

4.3- the method of gathering and analyzing data

This research data is based on real values and data of stock market and companies financial statements.

In this research, Pearson correlation coefficient was used for analyzing correlation and multi variable regression was used for testing the relationship between liquidity ratios and profitability. Unit radical test was also used to examine the stability of research variables. Research models are as following:

$$(1) ROA_{i,t} = \alpha + \beta_1 CR_{i,t} + \beta_2 LR_{i,t} + \beta_3 CLI_{i,t} + \beta_4 NLB_{i,t} + \beta_5 CCC_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 IND1_{i,t} + \beta_9 IND2_{i,t} + \beta_{10} IND3_{i,t} + \beta_{11} IND4_{i,t} + \beta_{12} IND5_{i,t} + \epsilon_{i,t}$$

$$(2) ROE_{i,t} = \alpha + \beta_1 CR_{i,t} + \beta_2 LR_{i,t} + \beta_3 CLI_{i,t} + \beta_4 NLB_{i,t} + \beta_5 CCC_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 IND1_{i,t} + \beta_9 IND2_{i,t} + \beta_{10} IND3_{i,t} + \beta_{11} IND4_{i,t} + \beta_{12} IND5_{i,t} + \epsilon_{i,t}$$

$$(3) NPM_{i,t} = \alpha + \beta_1 CR_{i,t} + \beta_2 LR_{i,t} + \beta_3 CLI_{i,t} + \beta_4 NLB_{i,t} + \beta_5 CCC_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 IND1_{i,t} + \beta_9 IND2_{i,t} + \beta_{10} IND3_{i,t} + \beta_{11} IND4_{i,t} + \beta_{12} IND5_{i,t} + \epsilon_{i,t}$$

Profitability is dependant variable being measured by Return of Assets (ROA), Return on Equity (ROE), Net Profit Margin (NPM). Liquidity indices are independent variables including Current Ratio (CR), Liquid Ratio (LR), Comprehensive Liquidity Index (CLI), Cash Conversion Cycle (CCC) and Net Liquid Balance. Financial Leverage (LEV), Company Size and Industry have been also used as control variables.

Breusch, Pagan and Hausman tests were performed for each research hypotheses. The results of performed tests suggested that random effect method has been selected to estimate regression model for mentioned hypotheses.

5- Research findings

5-1. stability

Using Levin, Lin & Chu (2002), Im, Pesaran & Shin (1979) and Philips (1994) tests the stability of dependant, independent and control variables were studied to test research hypotheses. Based on these tests the possibility is less than 5% accordingly all dependant, independent and control variables (except qualitative variable of industry that doesn't need to stability test) were stable during the research period.

5-2. descriptive statistics

Table 1 shows descriptive statistics of data.

Table 1: data descriptive statistics

	Abbreviation	Minimum	Median	Average	Maximum	Deviation
Dependant variables						
Return of assets	ROA	-0.31	0.11	0.13	0.57	0.11
Return of equity	ROE	-0.54	0.35	0.38	2.8	0.27
Net profit margin	NPM	-5.98	0.15	0.18	3.74	0.38
Independent variables						
Current ratio	CR	0.24	1.13	1.2	5.83	0.51
Liquid ratio	LR	0.08	0.64	0.71	3.73	0.11
Comprehensive liquidity index	CLI	0.007	0.83	0.85	5.07	0.43
Cash conversion cycle	CCC	258	157	189	775	159
Net liquid balance	NLB	-0.45	-0.02	-0.02	0.46	0.11
Control variables						
Company size	SIZE	8.91	12.18	12.31	16.05	1.51
Financial leverage	LEV	0.16	0.67	0.66	2.08	0.18

Average (median) of profitability criteria including ROA, ROE and NPM is 0.13 (0.11), 0.38 (0.35) and 0.18 (0.15), respectively. The average (median) of financial leverage is 66% (67%). The proximity of average and median indicates the low dispersion of data. Additionally, high amounts of financial leverage confirm that Iranian companies are highly dependent to liability and suggest that their non-payment risk is high. However, the standard deviation of all variables excepting cash conversion cycle is generally small. This means that the analysis of regression will lead into significant results indicating the strength of data.

5-3. analysis of correlation

As it is observed in table 2, the correlation between traditional and modern liquidity indices (excepting liquid ratio and cash conversion cycle) is confirmed as binary in a significant level of 1% but this correlation is weak showing that the information content of traditional and modern liquidity indices is different and accordingly users of financial statements should take a set of ratios into account to analyze companies liquidity.

The weak correlation between current and liquid ratios and comprehensive liquidity index can be related to the similarity of components used for calculating these ratios. There is a weak correlation between current and liquid ratios and net liquid balance because total assets have been placed in denominator to calculate this index; while short - term unpredicted liabilities should be provided from current assets and in other words company total assets has no effect on determining the liquidity status. Above results are according to the results of researches performed by Khoshtinat and Namazi (2004) and Dehghan Harati (2006).

The positive correlation between current ratios and cash conversion cycle confirms that to provide working capital in studied companies long-term financing is used instead of short-term financing. This positive relationship shows the opposition between two ratios relating to liquidity status and states that increased current ratio can't always mean increased liquidity. The obtained result is according to the results of researches performed by Khoshtinat and Namazi (2004), Dehghan Harati (2006), Namazi and Mansouri (2006), Richard and Laughlin (1980), Lyroudi and et.al (1999) and Lyroudi and Lazaridis (2000). Also, the correlation between liquid ratio and cash conversion cycle is not significant. One reason can be stated is that according to research information the major changes of cash conversion cycle are resulted from inventory turnover and inventory is not entered in calculating liquid ratio. The result accords with Namazi and Mansouri's research but it doesn't accord with researchers performed by Khoshtinat and Namazi (2004), Richard and Laughlin (1980), Lyroudi and Mc Carti (1992), Lyroudi and et.al (1999), Lyroudi and Lazaridis (2000) and Kamath (1989).

Table 2: results related to the correlation between liquidity indices

Correlation Matrix									
	ROA	ROE	NPM	CR	LR	CLI	CCC	NLB	SIZE
ROA	1								
ROE	0.435** 0.000	1							
NPM	0.429** 0.000	0.341** 0.000	1						
CR	-0.425** 0.000	-0.085** 0.010	0.067* 0.040	1					
LR	-0.413** 0.000	-0.077* 0.022	0.204** 0.000	0.796** 0.000	1				
CLI	0.353** 0.000	0.068 0.051	0.108** 0.001	0.495** 0.000	0.523** 0.000	1			
CCC	-0.081* 0.016	-0.115** 0.000	-0.021 0.526	0.242** 0.000	0.063 0.059	-0.258** 0.000	1		
NLB	0.264** 0.000	0.309** 0.000	0.186** 0.000	0.182** 0.000	0.239** 0.000	0.152** 0.000	0.081* 0.016	1	
SIZE	0.052 0.124	0.064 0.057	0.048 0.156	-0.136** 0.000	-0.042 0.185	-0.023 0.491	-0.040 0.237	-0.037 0.278	1
LEV	-0.438** 0.000	-0.418** 0.000	-0.348** 0.000	-0.282** 0.000	-0.252** 0.000	-0.249** 0.000	0.104** 0.000	-0.320** 0.000	-0.215** 0.000

**** and * indicate the significance level at the 0.01 and 0.05, respectively, based on two-tailed tests.**

5-4. regression results

Results of estimating regression equation by using three different criteria of profitability (i.e. ROA, ROE, and NPM) have been shown in table 3. Considering statistic f and P-value it can be concluded that all models are significant and all hypotheses are confirmed. Determination coefficient (R^2) for ROA, ROE and NPM is 0.45, 0.36 and 0.58, respectively. In addition the number of Dourbine- Watson is 85.89, 1.1 and 1.96, respectively indicating lack of autocorrelation error in models.

The results of testing hypothesis 1 indicate a significant and negative relationship between current ratio and profitability. Thus the first hypothesis is confirmed. The result of studying the relationship between current ratio and ROA is consistent with most researches of significant relationship but in terms of relationship type it doesn't accord with the results of researches of

Kamath (1989), Lyroudi and Mc Carti (1992). The result of studying the relationship between current ratio and ROE accords with other researches of significant relationship but in terms of relationship type it doesn't accord with the results of Kamath's research (1989). The result of studying the relationship between current ratio and NPM is according to the results of Lyroudi and et.al (1999) research.

The results of testing hypothesis 2 show a significant and positive relationship between liquid ratio and profitability. The result of studying the relationship between liquid ratio and ROA and ROE is consistent with researches of significant relationship but in terms of relationship type it doesn't accord with researches performed by Lyroudi and et.al (1999) and Lyroudi and Lazaridis (2000). The relationship between liquid ratio and NPM is consistent with the results of research performed by Namazi and Mansouri (2006).

Based on results of testing hypothesis 3 there is a positive and significant between comprehensive liquidity index and ROA and ROE but it wasn't observed any relationship between comprehensive liquidity index and NPM.

Based on results of testing hypothesis 4 there is a negative and significant relationship between cash conversion cycle and profitability criteria of ROA and ROE that is consistent with most researches of significant relationship but in terms of relationship type it isn't according to results of researches done by Lyroudi and Lazaridis (2000) and Lyroudi and Mc Carti (1992). There is no significant relationship between cash conversion cycle and NPM in this hypothesis that isn't consistent with result of researches done by Namazi and Mansouri (2006), Lyroudi and Lazaridis (2000) and Lyroudi and et.al (1999).

The results of testing hypothesis 5 indicate a positive and significant relationship between net liquid balance index and profitability.

It was specified about control variables that financial leverage has a negative relationship with profitability that isn't consistent with the results of Namazi and Ebrahimi's research (2009). There is a significant and positive relationship between company size and profitability that is consistent with results of most researches except Rezazadeh and Heidarian (2010) but in terms of relationship type it accords with the results of researches performed by Nazemi (2004), Eljeli (2004) and Nazir and Afza (2009) but it doesn't accord with Sharma and Kumar's research (2011). In studied hypotheses industry type didn't have complete effect on profitability. Result related to industry is consistent with results of researches done by Namazi and Rostami (2006) and Nazir and Afza (2009) but it doesn't accord with results of Noravesh and Heidari's research (2004).

Table 3

Panel Data Regression Test of Firm Profitability (ROA, ROE and NPM) on Liquidity Indices and Control Variables				
		ROA	ROE	NPM
Intercept	β	-0.034	-0.425	0.201
	(t)	(-2.57)**	(-6.28)***	(4.17)***
CR	β	-0.039	-0.062	-0.080
	(t)	(-2.48)**	(-2.67)**	(-2.29)**
LR	β	0.005	0.041	0.096
	(t)	(2.24)**	(2.11)**	(1.65)*
CLI	β	0.022	0.088	-0.030
	(t)	(4.18)***	(4.69)***	(-1.24)
CCC	β	-0.000	-0.000	-0.000
	(t)	(-3.43)***	(-2.59)**	(-1.45)
NLB	β	0.014	0.094	0.219
	(t)	(2.61)**	(2.69)**	(5.88)***
SIZE	β	0.007	0.030	0.020
	(t)	(7.84)***	(6.64)***	(9.19)***
LEV	β	-0.075	-0.767	-0.500
	(t)	(-9.11)***	(-12.04)***	(-16.81)***
R ²		0.45	0.36	0.58
Adjusted R ²		0.43	0.35	0.57
F		91.07***	71.59***	118.88***
DW		1.89	1.85	1.96

***, ** and * indicate the significance level at the 0.01, 0.05 and 0.1, respectively, based on two-tailed tests

6. Discussion and conclusion

Based on results of analyzing the correlation between traditional and modern liquidity indices it was signified that there is a correlation between these indices but considering that the information content of these indices is different it is recommended that users of financial statements take a set of ratios into account for analyzing companies liquidity and their decision makings.

The analysis of research hypotheses showed that there is a significant relationship between traditional and modern liquidity ratios and company profitability and considering that the information content of modern liquidity ratios is more different than traditional ratios so modern ratios can be used as appropriate tool to evaluate companies profitability.

Detailed analysis is required for studying the relationship between liquidity ratios and profitability ratios. When a conservative strategy is used and current assets are maintained more than optimal level of working capital or current liabilities are created less than the optimal level of working capital companies incur more operational costs (such as storage costs, costs of outstanding cash and etc.) and accordingly profitability is decreased that it shows the low efficiency of management in using existing resources to acquire profitability. The existence of positive relationship between liquidity and profitability states that companies of Tehran Stock Exchange have not yet placed in optimal level of maintaining working capital or they don't use optimal models for maintaining assets.

Considering the above research it is necessary to be defined some standards for liquidity indices in each industry by relevant financial institutions to provide a situation for exact analyzing of companies liquidity status by computing these ratios and comparing them with mentioned standards.

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