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\*Corresponding author: Mehdi Khodakarami, Department of Accounting, University of Tehran, Tehran, Iran  
E-mail: [mehdi.khodakarami@ut.ac.ir](mailto:mehdi.khodakarami@ut.ac.ir)

Reviewing editor:  
Collins G. Ntim, University of Southampton, United Kingdom

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## ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

# Working capital management, firm performance and macroeconomic factors: Evidence from Iran

Iman Soukhakian<sup>1</sup> and Mehdi Khodakarami<sup>1\*</sup>

**Abstract:** This paper investigates the impact of working capital management (WCM) on firm performance among listed Iranian manufacturing firms, focusing on the direct and moderating roles of inflation and GDP variables. This study uses the ordinary least squares with robust standard errors to analyze panel data covering the period 2010–2016. Two-stage least squares with robust standard errors is also used to control the endogeneity problem. The results show that the cash conversion cycle (CCC) is negatively related to return on assets and to refined economic value added (REVA). That is, the shorter time the span between an expenditure to purchase raw materials and the collection of the receivables for sold goods, the higher the performance. However, when endogeneity problem is controlled for, CCC loses its relationship to REVA. Macroeconomic variables are positively and significantly related to ROA, but only inflation is significantly related to REVA. Moreover, macroeconomic factors do not moderate the relationship between WCM and firm performance.

### ABOUT THE AUTHORS

Iman Soukhakian is a student of accounting at the University of Tehran, Tehran, Iran. Related to his interests, he is fond of corporate finance, business strategy, cost stickiness and audit quality.

Mehdi Khodakarami is a student of accounting at the University of Tehran, Tehran, Iran. His research interests lie around the issues of corporate finance, financial reporting quality, and auditing.

### PUBLIC INTEREST STATEMENT

This study contributes a determination of the moderating role of macroeconomic factors (GDP and Inflation) for the relationship between WCM and firm performance. Further, the relationship macroeconomic factors have to that performance, has been investigated. The findings show that the adoption of an aggressive working capital strategy leads to the improvement of accounting-based performance. However, WCM is not significantly related to economics-based performance, while the endogeneity is controlled. To the best of the authors' knowledge, limited attention has been paid to WCM and economics-based firm performance, and their relevant endogeneity problem. Based on the findings, macroeconomic factors have different direct consequences for short-term and long-term performances of Iranian listed manufacturing firms. Also, these factors don't moderate the relationship between cash conversion cycle and relevant firm performance measures. Based on the literature reviewed, this paper is a pioneer in investigating the moderating role of macroeconomic condition in the relationship between WCM and firm performance, as well as evaluating the influence of WCM on economics-based performance concept.

**Subjects: Economics; Finance; Business, Management and Accounting**

**Keywords: Working capital management; return on assets; refined economic value added; profitability; cash conversion cycle; macroeconomic factors**

## 1. Introduction

The business of a firm involves a series of activities performed in an established manner, and this forms their general business operations. To conduct their business effectively and efficiently, they must adopt and follow a set of techniques and policies. Working capital management (WCM) foregrounds the short term and the improvement of processes, beginning with purchases of material and payments to suppliers and ending in the collection of receivables from the customer. WCM is a key parameter for policy making, and it influences multiple aspects of business, including profitability and liquidity. The authors' calculations indicate that the average value of accounts receivables, accounts payables, and inventories in Iranian non-financial listed firms from 2010 to 2016 were 21%, 9%, and 17% of total firm assets, respectively. Because WCM deals with the central business processes of firms and is closely tied to firms' financial decision, it is considered to have a significant influence on firm performance.

In the last two decades, many scholars turned to investigation of the relationship between WCM and firm performance (Bhatia & Srivastava, 2016; Lyngstadaas & Berg, 2016). Studies in this area have been concentrated on accounting-based measures of performance. However, these measures give an incomplete picture, as Stewart (1994, p. 75) stated that economic value added (EVA) is rated in that publication as being nearly 50% more accurate than the closest accounting-based competitor (including ROA) for explaining changes in shareholder wealth. Unlike accounting-based performance measures, which are generally recognized, economics-based measures of performance tend to be exclusive measures that have not been received sufficient attention in the fields of finance and accounting.

The authors believe that Iran has specific economic and institutional characteristics which justify the importance of this research. High inflation is considered as an important indicator of economy in Iran. According to the World Bank database, the average inflation in Iran was 19.5% between 2010 and 2016 (World Bank Site, Iran Overview). In 2016, Iran ranked 22 among the 191 evaluated countries (IMF report). Further, Iran has been exposed to recession in many years. During the downturn, an increase occurs in the speed of corporate asset turnover, as well as the expected time to sell the goods while the collection of receivables may decrease. Furthermore, the firm margin decreases and cash inflow is weakened in the markets where there is no complete competition due to a drop in demand. In addition to these general cases, a number of major shocks in Iranian economy such as rising exchange rates or prices for energies may have put serious pressure on the working capital of Iranian companies.

In Iran's economy, where the financial system relies heavily on the banking system, most of the resources of the firm finance through the banks; In addition, many of the firms are indebted to the bank system, and some are overdue (Shayeganfard, 2012). As a result, they are not able to refinance from the banking system to finance their working capital until settling their debts completely, which increases the importance of working capital management (WCM). Short-term bonds are considered as one of the most well-known financial instruments which are widely used in the world, although it is not used in Iran due to Islamic religious issues. Although few distinct types of these bonds such as participation bonds or project financing bonds are used in Iran, many of the common types of bonds such as zero-coupon bond, put bonds, held-to-maturity bonds, convertible bonds, and variable-rate bonds are not used in Iran. Further, other short-term financing instruments such as receivable securitization, asset-based lending, floor plan financing, factoring, and premium financing are not common in Iran. Due to the limitations of banking financing and other financing methods, Iranian firms have been exposed to the problem of working capital financing

(short-term financing), in which efficient and effective working capital management is required. In this study, a number of Iranian firms were examined to analyze the relationship between WCM and firm financial performance.

The first question here is whether or not effective WCM contributes to firms' accounting-based and economics-based performances for listed Iranian manufacturing firms. This study extends the existing literature by expanding knowledge of the impact of WCM on economics-based performance measures. By investigating the effects of WCM on these measures, the influences of WCM on the accounting-based (that is, representatives of short-term performance) and economics-based (emphasizing firms' long-run performance and their value) performance measures and their comparison appear. Certain influences of WCM on financial performance measures have been investigated empirically in previous studies (e.g., Deloof, 2003; Lyngstadaas & Berg, 2016; Abuzayed, 2012, which have focused on accounting-based and market-based performance measures). Considering the special economic and institutional conditions of Iran (which is discussed in the previous paragraph), the evaluation of the relationship between WCM and the firm financial performance including both accounting-based and economics-based contributes to the literature, even the relationship between WCM and accounting-based performance which was extensively examined in previous studies.

As time passes, the effects of macroeconomic factors on finance and accounting have increased in prominence. In developing countries such as Iran, the financial performance of firms and their financial position have been dramatically influenced by macroeconomic conditions. Empirical findings also support the issue that macroeconomic factors such as gross domestic product (GDP), the inflation rate, the exchange rate, the price of crude oil, and other relevant factors have significant influences on firm performance and WCM (García-Teruel and Martínez-Solano, 2007; Mathuva, 2010). The role of GDP and inflation rate in the literature related to WCM and firm financial performance (especially accounting-based performance) has attracted a lot of attention (e.g., Chiou, Cheng, & Wu, 2006; Deloof, 2003; Enqvist, Graham, & Nikkinen, 2014; Mathuva, 2010; Shi, Zhu, & Yang, 2016). GDP provides a meaningful content about the overall macroeconomic condition of any country. In addition, it is considered as a comprehensive measure of economic performance (Bregar, Rován, & Pavšič, 2008). Furthermore, it is a single number which can provide a general picture of all economic activities (Konchitchki & Patatoukas, 2014). The overall macroeconomic condition can be viewed as either booming, which is determined by a higher GDP by which firms are able to improve their profitability and productivity throughout the operations and their relevant decisions, or failing economy, which is opposite to booming economy. For example, the failing economy condition may lead to the prolongation of the receivable collection period. In addition, in this condition, customers' demand decreases, or firms attempt to maintain a higher level of inventory, both leading to an increased inventory turnover period. Further, firms fail to pay off the short-term obligations on a timely basis, all of which play a significant role in WCM and firm performance (Golverdi and Mehrabanpour, 2017).

Inflation is considered as another factor which was considered in literature, which is an index which provides relevant awareness about the purchasing power of national currency and measures the economic stability. During the inflationary period, all different groups (e.g., suppliers, manufacturers, and customers) are affected by. The argument about the impact of inflation on WCM and firm performance can be that it increases the price of inputs in production, including raw material and overhead costs, which can influence the volume of production. In this condition, firms may prefer to accumulate finished goods to gain additional benefits in the future which increases the inventory turnover period. In response to the increase in the production cost, firms may increase the sales price, which might bring about an increase in the operating income, that may be regarded as perfidious and temporary. Furthermore, inflation can negatively influence the purchasing power of customers, which subsequently affects the credit policies and receivable collection period of the firm (Golverdi and Mehrabanpour, 2017). Based on the above and similar arguments, it is logically expected that inflation plays a significant role in firm performance and WCM.

Considering the significant role of GDP and inflation with respect to the financial performance and WCM, along with the gap in the literature, the second research question raised is whether GDP and inflation affect firm performance (both of accounting and economics performance measures) or not. The last question of this paper is whether the relationship between WCM and firm performance is moderated by the macroeconomic factors.

This study uses the OLS regression method with robust standard errors to analyze panel data covering the period 2010–2016. Two-stage least squares with robust standard errors is also used to control the endogeneity problem. The results show that the CCC is negatively related to ROA and REVA. However, when endogeneity problem is controlled for, CCC loses its relationship to REVA. Macroeconomic variables are positively and significantly related to ROA, but only inflation is significantly related to REVA. Moreover, macroeconomic factors do not moderate the relationship between WCM and firm performance.

By considering the strong justification and existing literature regarding the influence of these macroeconomic factors on working capital management and firm performance, the authors believe that this study contributes to the literature in three ways. First, it is a relevant, comprehensive study that determines the moderating role of the GDP and inflation in the relationship between WCM and firm performance (including both accounting-based and economics-based measures of performance), which has not hitherto been shown. Second, there is little evidence on the influence of these macroeconomic factors on economics-based performance measures. This paper provides comparative results to elucidate this issue. Third, there is a considerable evidence on the influence of GDP and inflation on accounting-based performance measure. However, this is the first study which examines the influence of inflation and GDP on accounting-based and economics-based performance measures in Iran. The distinguished condition of economy and institution of Iran leads to a particular set of results which can improve the literature.

The remainder of the paper proceeds as follows. First, the conceptual framework is discussed, and a review of previous relevant papers, empirical and theoretical is performed. Second, the sample is described, the justifications of variables are provided in accordance with the literature, and preliminary tests are conducted. Third, the results of the analysis of the data and the relevant tests are provided. Finally, the conclusions, the implications of the findings, limitations of the study, and a few suggestions for future research are provided.

## 2. Conceptual framework and literature review

### 2.1. Working capital management and firm performance

It is generally accepted that WCM has a significant influence on firm performance and profitability (Deloof, 2003; Gill, Biger, & Mathur, 2010; Kabuye, Kato, Akugizibwe, & Bugambiro, 2019; Yazdanfar & Öhman, 2014). Focusing on the speed of the cash cycle through management of receivables and payables, WCM contributes to the generation of profitability and liquidity (Johnson & Soenen, 2003). Moreover, the management of inventory also effectively involves managing liquidity and profitability. Gill et al. (2010) and Abuzayed (2012) conducted studies (with different methods and sample data) in the United States and Jordan, respectively, to investigate the influence of CCC on gross operating income as a proxy for accounting-based measures of performance. They found a positive relationship between CCC and gross operating income (a proxy for profitability). However, many other studies found a negative relationship between WCM and firm performance. For instance, Yazdanfar and Öhman (2014) confirmed a negative relationship between CCC and ROA (as a proxy for accounting-based measure of performance) in Swedish small and medium-sized enterprises (SMEs). Lyngstadaas and Berg (2016) investigated the influence of account receivable, inventories, account payable and cash conversion cycle as proxies for WCM on ROA and return on invested capital (ROIC) in Norwegian SMEs and found negative relationships between firm performance (ROA and ROIC) and CCC (and with its components). Thakur (2015) also examined the relationship between CCC and firm performance as measured by ROA and Tobin's Q (a combination of an accounting-based and a market-based measure

of performance) among Bangladeshi firms. Firm growth was determined to be a moderating variable. The results indicated a negative relationship between CCC and ROA, but the model of Tobin's Q was not found to be significant. Additional results showed that firm growth has no significant moderating effects on profitability. It is worth noting that the insignificance of Tobin's Q model shows that WCM did not have a significant influence on the value of Bangladeshi firms. Afrifa and Tingbani (2018) examined the relationship between CCC and firm performance (measured by Tobin's Q and ROA) within UK SMEs and found that CCC is significantly and negatively related to firm performance. However, when the availability of cash flow was accounted for in the models as a moderating variable, the direction of the relationships became significant and positive. Finally, Jakpar et al. (2017) investigated the relationship between CCC and ROA in Malaysian firms and reported that CCC is not significantly related to ROA; thus, WCM had no share in firm performance or level of profitability.

Because most empirical studies argue that effective WCM (which should lead to a reduction in CCC) results in better accounting-based performance, this study hypothesizes that:

*Hypothesis 1.* There is a significant negative association between cash conversion cycle and return on assets among listed Iranian manufacturing firms.

Another aspect of firms influenced by the decisions of executive managers is firm value. By following the traditional view of WCM and accounting-based measures of performance, they cannot provide an answer to the question of how WCM can enhance firm value. To be able to bridge the gap between WCM and firm value, other appropriate measures of performance must be employed. Generally, economics-based measures of performance, such as EVA, are significantly related to firm value and shareholder wealth maximization (Stewart, 1994, p. 75). In this vein, previous work has strongly argued that WCM should be used to improve firm EVA (Gitman, Juchau, & Flanagan, 2010). As a result, WCM (as an indicator of short-term decision-making) may be related to EVA and other relevant measures, which provide essential information on firm value and other relevant long-run purposes.

The EVA calculation formula is based on operating income (after taxes), cost of capital, and capital components invested. To be able to deduce the influence of WCM on EVA and other similar measures as refined economic value added (REVA), it is necessary to investigate whether WCM can influence the formulas of these measures significantly. It can be argued that when a firm holds a considerable amount of working capital, a significant portion of that company's resources is tied up in two of the three components of CCC (account receivables and inventories). This could result in a lack of liquidity that would interact with the capital structure and the relevant costs of capital and debt. Stephens and Bartunek (1997) argued that reducing WCM, which is entailed by a reduction in accounts receivable and inventory, contributes to increases in EVA and shareholder wealth maximization. Effectively applied WCM, which usually leads to increases in free flow of cash, results in increases in operating income and subsequently, the EVA. Here, it is worth noting that following an aggressive strategy that leads to an extensive use of short-term credit sales, high turnover of inventory, and stretching out bill payments, can lead to increases in operating income and subsequently EVA (the opposite description would apply to a conservative strategy). This means that WCM and the application of related strategies would have a significant influence on the level of EVA. Stephens and Bartunek (1997) also concluded that CCC should be combined with EVA so that management would have the incentive to do the right thing for the firm and for its shareholders. Moreover, when considering how to maximize shareholder value, the influence of ineffective decisions regarding working capital and their negative consequences should also be considered (Cooper, Ramachandran, & Schoorman, 1998).

On this theoretical foundation and following previous empirical results, this study hypothesizes the following:

*Hypothesis 2.* There is a significant negative association between cash conversion cycle and revised economic value added among Iranian listed manufacturing firms.

## **2.2. Macroeconomic factors and firm performance**

Many empirical studies, with different proxies and methods, have investigated the influence of such factors on firm performance (using accounting-based and market measures). To a great extent, they report that macroeconomic conditions have a significant influence on firm performance (Abaidoo & Kwenin, 2013; Fama, 1981; Issah & Antwi, 2017). Inflation is one of the most pervasively used macroeconomic indicators in the literature. This measure shows a persistent increase in the prices of goods and services and a persistent decline in purchasing power. Generally, inflation increases a firm's expenditures. On the other hand, it also increases the price of goods and may negatively influence demand. If the outcome of these effects is positive on the whole (where increase in income growth is greater than increase in cost growth), the profitability and performance of a firm improve. Empirical studies state that inflation has a significant influence on production costs, meaning that increases in the rate of inflation reduce profitability. Lee (2003) deduced that the rate of inflation is closely related to firm performance (measured by ROA); however, the direction and intensity of this relationship depends upon the resulting supply, fiscal, and monetary disturbances. From another point of view, in inflationary periods, lenders increase their interest rates to cover inflation losses to profit in exchange for the risk of lending money. Lenders' rate increases elevate the borrowing costs of firms, decreases firm profitability, and then increases the cost of capital (Kaminsky, Reinhart, & Vegh, 2003). However, unlike Kaminsky's (2003) results, which indicated that inflation leads to increases in the cost of capital and subsequent reduction in the EVA, Ramadan (2016) found that inflation is positively and significantly related to EVA. Thus, there is mixed evidence on the influence of inflation on EVA, as a proxy for economics-based performance measure.

As there is no strong evidence of concerning the relative acceleration of income growth and expenditures, and there is mixed empirical evidence on the influence of inflation on accounting-based and economics-based measures of performance, no direction of association can be presumed. The following hypotheses are posited:

*Hypothesis 3.* There is a significant association between the rate of inflation and return on assets among listed Iranian manufacturing firms.

*Hypothesis 4.* There is a significant association between rate of inflation and revised economic value added among listed Iranian manufacturing firms.

GDP is the market value of all goods and services provided in a country within a period of one year. It is widely recognized as a comprehensive measure of economic performance (Bregar et al., 2008). Much previous work has argued that GDP is significantly and positively related to firm performance (Baños-Caballero, García-Teruel, & Martínez-Solano, 2012; Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Lyngstadaas & Berg, 2016; Pais & Gama, 2015; Ramadan, 2016). The argument is that in a favorable economic cycle and with growth in the economy, conditions favor firms that are increasing their sales and pursuing appropriate policies. In turn, in favorable economic conditions, in which the income per capita of the population is higher, the variety of goods consumed increases (Jackson, 1984), which leads to increases in profit margins and in firm value. Additionally, so long as good economic conditions prevail, firms can take advantage of economies of scale. In this way, they can purchase raw materials for a more reasonable price, which leads to reductions in the cost of goods and reductions in relevant expenditures. Drawing on the majority of previous empirical findings, which favor the belief in the positive influence of economic performance and activity on firm performance, the following hypotheses are posited:

*Hypothesis 5.* There is a significant positive association between gross domestic product and return on assets among listed Iranian manufacturing firms.

*Hypothesis 6.* There is a significant positive association between gross domestic product and revised economic value added among listed Iranian manufacturing firms.

### **2.3. Moderating role of macroeconomic factors**

Factors outside a firm's control, such as macroeconomic factors, must play an important role in short-term decisions and policies of firms, including WCM policies. Ali and Khan (2011) argued that poor economic conditions (such as recession) affect firm policies, including WCM.

During inflationary periods, the state of working capital fluctuates greatly, which requires a response with relevant policies to strike a balance. Mathuva (2010) showed that there is a significant relationship between inflation and CCC. In inflationary periods, the need for working capital increases. Moreover, as the rate of inflation increases, sales plunge (Deloof, 2003), which leads to decreases in firm revenue and subsequently, profit margins. Thus, firms must extend the credit period of their sales to compensate the reduction of profit margins, which results in a longer CCC (Enqvist et al., 2014). In addition, inflation can negatively influence the purchasing power of customers, which subsequently affects firm credit policies and receivable collection periods (Golverdi and Mehrabanpour, 2017). In such periods, it is hard for firms to maintain their level of profitability to finance working capital (Sundar, 1980). Moreover, during such periods, firms deal with longer CCCs, as their inventories are tied up and their receivables do not materialize. In support of previous studies, Eldomiaty, Anwar, and Ayman (2018) indicated that the inflation leads to increases in the cost of goods sold; therefore, firms react by staking inventories and extending receivables; the result of this is to increase the length of CCC. Further, Golvardi and Mehrabanpour (2017) stated that inflation leads to an increase in the production cost, which plays a positive role in the CCC. In an inflationary period, firms may face with liquidity problems which disable firm to meet the short-term obligations on a timely basis, leading to a longer CCC (Eldomiaty et al., 2018; Shi et al., 2016). Few studies have found that the rate of inflation has no substantial influence on working capital. Yenice (2015) investigated the influence of macroeconomic factors on CCC and the level of working capital, using artificial neural network modeling. His finding illustrated that the rate of inflation influences CCC and the level of working capital, although such influences are not very important. Moreover, Doruk and Ergün (2019) found that CCC is positively related to CCC but the influence is not significant. This study hypothesizes that while CCC has a direct negative effect on ROA and REVA, inflation may have a moderating effect on these relationships. Following the dominant empirical evidence, it can be expected that when the rate of inflation is higher, firms experience longer CCC and better performance. Here, these results in the following hypotheses being posited:

*Hypothesis 7.* Inflation weakens the negative effect of cash conversion cycle on return on assets among listed Iranian manufacturing firms.

*Hypothesis 8.* Inflation weakens the negative effect of cash conversion cycle on revised economic value added among listed Iranian manufacturing firms.

Generally, previous studies have indicated that economic circumstances have a significant influence on the level of WCM (Blinder & Maccini, 1991). Some previous empirical work has investigated GDP's relationship with accounts receivables and related credit policies (Shi et al., 2016). Shi et al. (2016) found that a significant and negative influence here, which means that when macroeconomic conditions are unfavorable, to compensate for reduced cash sales (and generally reduced cash flow), firms increase the credit they grant to encourage customers to increase demand. Further, customers cannot pay off their debt on a timely basis during an economy downturn, leading to the prolongation of the receivable collection period (Golverdi and

Mehrabanpour, 2017). Moreover, economic conditions can also have a significant influence on the level of inventory. The evidence regarding the influence of economic condition (with GDP as a proxy) on the level of inventory is mixed. Blinder and Maccini (1991) found that GDP has a significant influence on the level of inventories; thus, in recession conditions, a considerable reduction in inventory results. However, Chiou et al. (2006) stated that during recessions, firms might increase their inventory levels to gain additional benefits. In the downturn economic condition, firms may fail to pay off the short-term obligations on a timely basis, which results in increasing the debt payment period (Golverdi and Mehrabanpour, 2017). Mansoori and Muhammad (2012) investigated the relationship between GDP and CCC (CCC). They found that there exists a significant and negative relationship between GDP and CCC in Singapore. This implies that when firms are functioning amid general economic prosperity and expansion, they pursue aggressive strategies. Wasiuzzaman and Arumugam (2013) also investigated the relationship between CCC and GDP. They argued that during a recession, firms will attempt to shorten their CCC by squeezing as much cash as possible. Baños-Caballero, García-Teruel, and Martínez-Solano (2013), Zariyawati, Taufiq, Annuar, and Sazali (2010), Moussa (2019) and Doruk and Ergün (2019) also found a positive relationship between economic conditions and CCC. So, during an expanding economy, firms increase their investment in working capital. However, Eldomiaty et al. (2018) showed that when the economy is not generally growing, firms attempt to remain at their existing levels of working capital. In contrast with the strand of empirical studies that have found a significant relationship between GDP and WCM, few studies found no significant relationship between WCM and GDP. Yenice (2015) reported that while GDP is influential on CCC and the level of working capital, such influences are not very important. Nyeadi, Sare, and Aawaar (2018) stated that the GDP growth doesn't have significant influence on working capital of manufacturing listed firms on Ghana stock exchange market. Moreover, Baños-Caballero, García-Teruel, and Martínez-Solano (2010) and Abbadi and Abbadi (2013) argued that the state of the economy doesn't have significant influences on CCC.

This study hypothesizes that while CCC has a direct and negative effect on ROA and REVA, GDP may have a moderating effect on them. To sum up, when economic conditions are prosperous and favorable, regarding the majority of available evidences, firms experience the better performance; however, there exist mixed evidence on the influence of GDP on WCM and its proxies (such as CCC), and there is no way to prove directionality. Therefore, the following hypotheses are posited:

*Hypothesis 9.* Gross domestic product moderates the negative effects of cash conversion cycle on return on assets among listed Iranian manufacturing firms.

*Hypothesis 10.* Gross domestic product moderates the negative effects of cash conversion cycle on revised economic value added among listed Iranian manufacturing firms.

### 3. Description of sample and variables' justification

The population of the study is all manufacturing firms traded on the Tehran Stock Exchange. To increase the reliability of the results, firm data were directly extracted from the audited financial statements that are available on the CODAL database, which have been used extensively by previous researchers (e.g., Alipour, Ghanbari, Jamshidinavid, & Taherabadi, 2019; Salehi, Lari Dashtbayaz, & Khorashadizadeh, 2018). Further, all macroeconomic data were obtained from the World Bank database. To increase the reliability of the results, the following filters were applied and only those firms passed the filters were considered for data analysis:

- (1) Firms which had operating activity during the relevant seven-year period under review;
- (2) Firms were active in the stock exchange during the period under review;
- (3) Enough information was available for the firms and their financial statements were audited;



- (4) Firms were both for-profit and not operating as investment companies, financial intermediaries and banks, holding and leasing companies since the operation of these industries and sectors were different from other member companies (manufacturing firms).

The final dataset consists of 111 firms and 777 observations (2010 to 2016). It is also noteworthy that analyzing a longer series of accounting data (e.g. more than five years) may help alleviate the concern about the unreliability of accounting data (Alipour et al., 2019).

The industries were selected based on the criteria and classification used by Tehran stock exchange. As shown in Table 1, the observations were distributed among 19 industries. Regarding the industry distribution of sample, automotive and the manufacturer of automotive parts has the highest number of firms in the dataset (16 firms) and manufacturer of wood products, extractor of coal, producer of paper and agricultural, animal husbandry and related products have the lowest share in the dataset and one firm operates in each of these industries. It is worth noting that the sample data are manufacturing firms.

Table 2 gives the descriptive statistics of the variables in the sample. The average ROA of companies in that dataset is 13%, which is higher than the average ROA of the UK firms (around 5%) evaluated by Afrifa and Tingbani (2018). The average REVA of the firms is -350,852, which indicates that listed Iranian manufacturing firms are not successful in creating value. The mean CCC for Iranian firms is 205 days, much greater than that of the other studies, such as the work of Lyngstadaas and Berg (2016) (where mean CCC is found to be around 73 days) or Deloof (2003) (where mean CCC is around 44 days). This suggests that a larger proportion of manufacturing firms traded on the Tehran stock exchange take longer to collect receivables, that spend more time holding inventories before the sales, and where less time is required to pay off short-term obligations. Alternatively, this could indicate businesses' dependence on external financing (Maness, 1994). The average cash flow in Iranian companies is 17%, which is higher than the cash flow in UK firms (10%). Further, the average size of an Iranian company is 6 (2,882,766 million Rial). Further, as about 66% of total assets in Iranian companies are debt, firms are exposed to considerable financial costs, which influences their profitability and their cost of capital (and subsequently REVA values) negatively. Moreover, the average rate of inflation from 2010 to 2016 (19.5%) indicates that, during the time period of the study, inflation may have had an influence on CCC of the given firms, with consequences for their overall performance. The current assets of Iranian firms allocated 65% of the total assets. Thus, a higher safety margin is available for Iranian firms although there is less potential for earning return for Iranian firms since the returns generated from current assets are generally lower than those from fixed assets. Further, the mean of CLR is 87%, which imposes a considerable threat to the financial performance and liquidity of the firms in the short term. The mean VNOI for Iranian firms is 0.271 is less than that of the other papers. The results are consistent with those in the study of Abuzayed (2012), where the mean VNOI for Jordanian listed firms was 0.336, indicating less volatility of financial performance among Iranian firms.

Research variables are defined as follows:

CCC is a common measure of WCM, defined as the "time span between the expenditure for the purchases of raw materials and the collection of receivables of sold goods" (Gill et al., 2010). It is a dynamic measure (Gitman, 1974), and it uses data from both balance sheets and income statements (Lyngstadaas & Berg, 2016). It has three main dimensions: inventory acquisition, receivables collection, and short-term debt payment. Many previous studies have employed CCC as a proxy for WCM (Deloof, 2003; Gill et al., 2010; Lyngstadaas & Berg, 2016; Yazdanfar & Öhman, 2014). CCC is calculated as follows:

$$\text{Cash conversion cycle} = \text{Number of days of accounts receivable} + \text{Number of days of inventory} - \text{Number of days of account payable}$$

**Table 1. Industry composition**

Industry name	Firm-year observation	% of sample
Automotive and the manufacture of automotive parts	112	14.40
Pharmaceutical materials and products	105	13.50
Basic metals	91	11.70
Cement, lime and plaster	91	11.70
Chemical products	77	10
Food and beverage products, except sugar	63	8
Tile and ceramic	42	5.40
Other nonmetallic mineral products	35	4.50
Rubber and plastic	28	3.60
Machinery and equipment	21	2.70
Sugar	21	2.70
Extraction of metal ores	21	2.70
Manufacturing of metal products	14	1.80
Petroleum products, coke and nuclear fuel	14	1.80
Textiles	14	1.80
Wood products	7	1
Extraction of coal	7	1
Paper products	7	1
Agriculture, animal husbandry and related products	7	1
Total	777	100.00

Profitability can be measured in multiple ways. Researchers such as Deloof (2003), Gill et al. (2010), and Mathuva (2010) have used net operating income and gross operating income as proxies for profitability. However, such measures are limited to statements of income. Other measures, such as ROA, ROE, and ROIC, can be employed, as they embrace a wider scope of financial reality; further, as they include both statements of financial position and income statements and indicate the profitability of a firm in relation to such other items as total assets or total owner of equity, they succeed in demonstrating profitability in a more accurate way. More recent papers have employed these indices to proxy for profitability and firm accounting-based performance (Lyngstadaas & Berg, 2016; Pais & Gama, 2015; Yazdanfar and Ohman, 2014). Because ROA accounts for all resources (including accounts receivable and inventory, which together form about 38% of total assets of firms and are considered two significant proxies of WCM) that can be reflected in financial statements, in this study ROA is chosen as a proxy for accounting-based performance measures. The relevant calculation follows:

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

Another category of performance measure that has not received sufficient attention is economics-based performance; its most pervasive proxy is EVA. This is a different measure from ones used previously because those usually depend on accounting information. These kinds of indices fall short because such accounting performance measures as earnings fail to measure changes in the economic value of the firm (Sabol & Sverer, 2017). EVA is a commonly used performance measure, and it has been judged to be one of the best developed ones for judging whether an objective is

Table 2. Descriptive result

	ROA	REVA	CCC	Inflation	GDP	Cash flow	Leverage	Size	VNOI	CAR	CLR	Firms' age	FFA
Mean	0.13424	-350,852.4	205.27	19.5572	4.82 × e11	0.1679568	0.661841	6.009	0.2715	0.645	0.872	3.5377	0.298
Median	0.11468	-67,228	168.79	17.2354	4.67 × e11	0.13265	0.658881	5.955	0.2334	0.682	0.919	3.68888	0.265
Std. deviation	0.14058	3,296,074.9	171.71	10.0031	7.53 × e10	0.229403	0.23744	0.564	0.1982	0.198	0.125	0.42368	0.187
Minimum	-0.63573	-53,069,667	-198.16	8.56972	3.86 × e11	-2.66833	0.090347	4.357	0.0002	0.111	0.34	2.19722	3.00E-04
Maximum	0.63928	30,115,914	1449.2	39.2664	5.99 × e11	1.985	2.315169	7.831	1.3	0.973	1	4.20469	0.857
First quartile	0.05502	-256,475.5	85.44	10.1372	4.19 × e11	0.05448	0.512409	5.67	0.1193	0.5	0.81	3.3	0.151
Third quartile	0.21074	9926	291.32	27.3574	5.84 × e11	0.246335	0.781744	6.288	0.3855	0.8	0.96	3.87	0.418
Skewness	0.107	-5.249	1.863	0.825	0.461	-0.681	1.35	0.512	0.949	-0.55	-1.67	-0.886	0.731
Kurtosis	2.48	108.074	7.803	-0.445	-1.251	40.228	6.63	0.759	1.053	-0.62	2.922	-0.16	-0.169
Observations													777

ROA, return on assets; REVA, refined economic-value added; CCC, cash conversion cycle; GDP, gross domestic product (nominal); CAR, current assets ratio; CLR, current liabilities ratio; VNOI, variability of net operating income; FFA, fixed financial assets to total assets.

achieved or not (Alsoboa, 2017). Although EVA is a good indicator of firm value, in this study REVA has been selected to measure economics-based performance. Bacidore, Boquist, Milbourn, and Thakor (1997) introduced this proxy for the first time. It provides an analytic framework to evaluate the operational performance of a firm and the value created for shareholders. To a large extent, the calculation of REVA is similar to that of EVA, with the difference that the costs of capital are calculated relative to the market value of corporate assets in REVA (Baseri, Atefat, & Baseri, 2013). Two main advantages accruing to the use of REVA can be found in the literature. First, positive values for REVA demonstrate that the return from operating income that flows to investors during the given period exceeds the potential opportunity cost of their capital. In EVA, an investor could receive an operating income-based return that is less than the opportunity cost of the use of their capital, even when EVA is positive. Thus, REVA better indicates investors' return adequacy and the risks incurred. Second, the market value of the firm, which is considered in the calculation of REVA, includes the values of both the physical assets and the executive managers' strategy and policies, but the book value of the firm, a component of EVA, only gives the values for the physical assets that are in place (Bacidore et al., 1997). As WCM must compromise among policies governing the effective acquisition and consumption of inventories, collecting receivables and paying short-term debts to decrease the risk of liquidity and the other relevant risks, it is expected that REVA can be a better proxy rather than EVA for economics-based performance. It is also worth noting that, since the idea and mechanical calculation of REVA are highly similar to EVA, the empirical evidence and conceptual framework for EVA can be generalized to REVA. This measure is calculated as follows:

$$REVA = \text{Operating income after taxes} - \text{Weighted average cost of capital} \\ \times (\text{Market value of total assets}^1 - \text{current liabilities})$$

Many macroeconomic factors have their own particular theoretical framework and meaning. This means that the selection of the relevant macroeconomic factors is an essential step that requires judgment (Humpe & Macmillan, 2009). To select the relevant macroeconomic factors to best suit the research design, the findings of the previous empirical findings and the relevant literature were analyzed.

The first variable selected is the rate of inflation. Within macroeconomic theory, lower rates of inflation indicate economic stability. Most governments in both developed and developing countries work to control it, and to stabilize prices, they may implement a variety of monetary and fiscal policies. Inflation demonstrates the power of the national currency, and when inflation is greater, more nominal money must be paid to acquire the same amount of goods or services as before the change. Based on the existing literature, inflation has significant influences on both financial performance and WCM. Based on the results of Lee (2003), Kaminsky et al. (2003), and Ramadan (2016), the inflation can influence firm accounting-based performance and cost of capital, which affects economics-based performance measures subsequently. In the present study, REVA used as a proxy for economics-based performance concept is affected by the cost of capital. Further, based on the literature, WCM and its components are influenced by inflation. In this vein, Enqvist et al. (2014) and Mathuva (2010) argued that inflation is significantly related to WCM. Although there is strong literature on the influence of inflation on both firm performance and WCM, little evidence is available for the moderating role of the inflation in the relationship between WCM and firm performance. Thus, it was selected as a moderating variable.

The second selected variable is GDP (nominal). This is widely considered to be the most important macroeconomic factor because it gives an economy-wide picture of the state of a country and its welfare. It is widely taken to be a comprehensive measure of economic performance (Bregar et al., 2008), and furthermore, it is a single summary number that can indicate all economic activity (Konchitchki & Patatoukas, 2014). Based on the results of the previous studies (e.g., Baños-Caballero et al., 2012; Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Lyngstadaas & Berg, 2016; Pais & Gama, 2015; Ramadan, 2016), GDP is significantly related to firm performance. In

addition, some other studies (e.g., Blinder & Maccini, 1991; Chiou et al., 2006; Shi et al., 2016, 2016) confirmed that the economic performance (GDP) plays a significant role on WCM and its components.

Regarding previous studies, the present study considered some control variables such as firm size, leverage, cash flow, current asset ratio (CAR), current liabilities ratio (CLR), fixed financial assets to total assets (FFA), firm age and variability of operating net income (VNOI) in order to improve the results and avoid the potential problems of endogeneity and omitted correlated variable (OCV) bias. Size is defined as a natural logarithm of total assets (Lyngstadaas & Berg, 2016). Afrifa and Tingbani (2018) showed that cash flow is positively correlated with firm performance, which could interfere with the relationship between firm performance and WCM. It is defined as the ratio of operating cash flow to total sales. Leverage has received a lot of attention in the literature. The leverage is defined as the proportion of total assets assigned to the total debt (Jakpar et al., 2017). Current assets ratio (CAR) is defined as the proportion of total assets which is devoted to current assets (Eljelly, 2004; Lyngstadaas & Berg, 2016; Pais & Gama, 2015). Current liabilities ratio (CLR) is measured as the proportion of total liabilities which is assigned to current liabilities (Lyngstadaas & Berg, 2016; Pais & Gama, 2015). Another control variable is related to the age of firm, which is calculated as the natural logarithm of number of years since establishing the firm (e.g., Baños-Caballero et al., 2010; Garcia-Teruel and Martinez-Solano, 2007; Mathuva, 2010). Another control variable is fixed financial assets to total assets (FFA), which is measured as the proportion of total assets assigned to fixed financial assets (Bhatia & Srivastava, 2016; DeLoof, 2003). Variability of operating net income (VNOI) is considered as the final control variable, which is measured as the standard deviation of net operating income of each firm during seven years divided by the total assets minus financial assets (Abuzayed, 2012; DeLoof, 2003).

#### 4. Results

Table 3 gives the Pearson correlation matrix for the variables. CCC, an index for WCM, is not significantly (for the three levels of significance investigated) related to the dependent variables (ROA and REVA). This result is consistent with those of Sharma and Kumar (2011), who found no significant correlation between CCC and ROA. Therefore, at first glance, CCC does not appear to be significantly related to firm performance. Moreover, all macroeconomic variables are significantly correlated with ROA, so there is evidence for the significant and direct relationship between macroeconomic variables and accounting-based measures of performance. This result is consistent with Lyngstadaas and Berg (2016), who found a positive and significant correlation between GDP and ROA. However, among macroeconomic variables, only inflation is found to be significantly related to REVA. As a result, the macroeconomic variables appear to bear a closer relationship to ROA than REVA. Based on the findings, macroeconomic variables are not significantly correlated with WCM. In addition, the paired correlations among control and independent variables are all negligible except the correlation between the leverage and VNOI (0.6167). To obtain a reliable result for the multicollinearity problem among the variables, variance inflation factor analysis (VIF) was employed. The results indicated that all of the values are below 10 and the highest VIF value is related to CAR (VIF = 5.52). Therefore, there is no problem for multicollinearity among explanatory variables (untabulated results).

The results shown in Table 3 provide initial insights on the influence of WCM on firm performance. To obtain robust results for the relationships and draw conclusion on the hypotheses, the following additional analyses have been applied.

##### 4.1. Results of the main analysis

The influence of WCM on firm performance was tested using pooled ordinary least squares (OLS). Estimates were obtained from Equations 1 and 2:

$$1) ROA_{it} = CCC_{it} + Control\ variables_{it} + \sum y_j IND + \sum \theta_k Year + \varepsilon_{it}$$

**Table 3. Correlations**

	ROA	REVA	CCC	GDP	Inflation	Cash Flow	Size	Leverage
Panel A: Correlation variables ROA to Leverage								
ROA	1							
REVA	0.026883	1						
CCC	-0.0138	0.01224	1					
GDP	0.170545***	0.026913	-0.03483	1				
Inflation	0.236445***	-0.13142***	-0.02163	0.39***	1			
Cash Flow	0.255545***	-0.02948	0.120977***	0.04	0.055944	1		
Size	0.127682***	-0.1705***	-0.0884**	-0.175***	-0.02609	0.149387***	1	
Leverage	-0.538***	-0.05831	-0.04333	0.005	-0.06646*	-0.0938***	0.064274*	1
CLR	0.145336***	0.030847	0.004471	-0.066*	-0.08926**	-0.05233	-0.00324	-0.11807***
CAR	0.121725***	0.008685	0.238763***	0.0006	0.076095**	-0.18697***	-0.14544***	0.146368***
Firms Age	-0.17227***	0.039164	0.124957***	-0.109***	-0.0267	-0.09521***	-0.13407***	0.105641***
FFA	-0.1233***	0.015988	-0.24825***	-0.009	-0.06785*	0.136722***	0.085628**	-0.17488***
VNOI	-0.189***	-0.0188	0.169***	0.08**	0.0144	-0.0325	0.133***	0.6167***
	<b>CLR</b>	<b>CAR</b>	<b>CAR</b>	<b>Firms Age</b>	<b>Firms Age</b>	<b>FFA</b>	<b>FFA</b>	<b>VNOI</b>
Panel B: Correlation variables CLR to VNOI								
CLR	1							
CAR	0.336733***	1						
Firms Age	-0.08185**	0.084172**		1				
FFA	-0.37035***	-0.88113***		-0.11817***		1		
VNOI	-0.135***	0.104***		0.148***		-0.069*		1

\*, \*\*and \*\*\*, Significant at 90%, 95% and 99%, respectively. REVA, refined economic-value added; CCC, cash conversion cycle; GDP, gross domestic product (nominal); CAR, current assets ratio; CLR, current liabilities ratio; VNOI, variability of net operating income; FFA, fixed financial assets to total assets.

$$2) \text{ Standardized REVA}_{i,t} = \text{CCC}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \sum \theta_k \text{Year} + \varepsilon_{i,t}$$

where ROA measures accounting-based performance and REVA measures economics-based performance<sup>2</sup>. CCC is selected as an independent variable to capture WCM. Moreover, dummy variables for industry and year are added to the models. The variables for size, cash flow, leverage, current assets ratio (CAR), current liabilities ratio (CLR), firm age, firm fixed assets to total assets (FFA), and variability of net operating income (VNOIT) are included in the models as control variables. Further, error term represents the variation of dependent variables that are not described by the exogenous variables in the models. Finally, to overcome problems of serial autocorrelation and heteroskedasticity, a robust standard error is employed in the pooled OLS regression analysis.

The influence of the macroeconomic factors' inflation rate and GDP on firm performance was tested using pooled OLS. To determine the direct influence of macroeconomic factors on firm performance, the macroeconomic factors' inflation and GDP are introduced separately, in different regression models. It is worth noting here that a dummy variable for years is dropped from the models because using it would cause a collinearity problem with the relevant macroeconomic variables. Estimates are obtained from the following equations:

$$3) \text{ ROA}_{i,t} = \text{Inflation}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$4) \text{ Standardized REVA}_{i,t} = \text{Inflation}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$5) \text{ ROA}_{i,t} = \text{GDP}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$6) \text{ Standardized REVA}_{i,t} = \text{GDP}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

To determine the moderating role (interaction effects) of macroeconomic variables and to provide reliable results, the macroeconomic factors' inflation and GDP and their interaction components are introduced separately, in different regression models. As in the previous section, the dummy variable for years has been dropped from the models because it would cause a collinearity problem with the relevant macroeconomic variables. The estimates for the analysis are obtained from the following equation:

$$7) \text{ ROA}_{i,t} = \text{CCC}_{i,t} + \text{Inflation}_{i,t} + \text{Inflation}_{i,t} * \text{CCC}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$8) \text{ Standardized REVA}_{i,t} \\ = \text{CCC}_{i,t} + \text{Inflation}_{i,t} + \text{Inflation}_{i,t} * \text{CCC}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$9) \text{ ROA}_{i,t} = \text{CCC}_{i,t} + \text{GDP}_{i,t} + \text{GDP}_{i,t} * \text{CCC}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

$$10) \text{ Standardized REVA}_{i,t} = \text{CCC}_{i,t} + \text{GDP}_{i,t} + \text{GDP}_{i,t} * \text{CCC}_{i,t} + \text{Control variables}_{i,t} + \sum y_j \text{IND} + \varepsilon_{i,t}$$

The results of the first model show that CCC is negatively and significantly related to ROA. This empirical result supports the first hypothesis; however, the correlation matrix indicates no support. This expresses the fact that on average, when firms reduce the trade credit they grant for sales, less of their inventory is tied up, and bill payments are stretched out, and they are able to achieve higher profitability. This result confirms the work of previous authors (Lyngstadaas & Berg, 2016; Thakur, 2015; Yazdanfar & Öhman, 2014). Furthermore, it does not support Gill et al. (2010) or Abuzayed (2012). Moreover, cash flow and size have a positive, significant relationship with ROA, which confirms the results of the correlation matrix. For size, this may be because when the firms are larger, they can attract more customers and take greater advantage of economies of scale. The positive influence of cash flow on ROA could explain the consideration that when cash sales are in a greater proportion to total sales, the amount of bad debt is lower; thus, higher profitability can be achieved. The significant and negative relationship between leverage and ROA confirms the results of the correlation matrix. This relationship can be attributed to the fact that when a firm is

highly leveraged, it incurs significant borrowing costs, which then leads to decreases in profitability. Based on the results, a positive relationship between CAR and ROA confirmed the results of correlation matrix, which supports the idea that more conservative policies and keeping more amount of current assets favor financial performance. Further, CLR is not significantly related to ROA, which is inconsistent with the results of correlation matrix. Furthermore, a negative relationship between FFA and ROA confirmed the results of correlation matrix, indicating that the negative aspects of investing in other firms exceed the turning points of the investments and have negative effects on the financial performance of the firms. In addition, the result of firm age confirmed the relevant result of correlation matrix and indicated that younger firms are able to have better financial performance. Finally, the results explain that the firms with better financial performance experience much more volatility of operating income, which are not in line with the results of correlation matrix.

Same as the first model, in the second model, the result shows that CCC is negatively related to REVA, which supports the second hypothesis. However, it is not consistent with the results of the correlation matrix. Because the effective use of WCM (which is usually followed by a reduction in CCC) generally leads to increases in liquidity and a subsequent reduction in the cost of capital, it can also lead to increases in REVA (as a proxy for firm value). Stephens and Bartunek (1997) argued that reductions in WCM (i.e., in effective WCM) contribute to EVA and maximization of shareholder wealth, which to a great extent is confirmed by the results of this segment. Further, no control variable has significant influence on REVA, except the leverage and size, which are negatively associated with REVA. The finding of leverage in regression analysis supported that of correlation matrix. It is worth considering that inverse relationships might stem from the endogeneity problem (Deloof, 2003; García-Teruel and Martínez-Solano, 2007). Therefore, profitability and economics-based performance can also affect the WCM, which makes it necessary to consider and control the endogeneity problem.

Based on the result of the third model, the influence of inflation on ROA is positive and significant, which supports the third hypothesis. The results also confirmed by the correlation matrix. Thus, in inflationary periods, expenditure increases. On the other hand, the price of final goods also increases, and inflation generally has a negative influence on market demand. Nevertheless, it is evident that in inflationary periods, income growth accelerates is more than expenditures do. To some extent, this result does not accord with previous work (Kaminsky et al., 2003), which can be attributed to supply, fiscal, or monetary disturbances (Lee, 2003). Unlike the third model, Inflation has a negative and significant influence on REVA in the fourth model, which supports the fourth hypothesis. This result is confirmed by the correlation matrix. It is evident that inflation negatively influences economics-based performance and firm value. The negative relationship between inflation and REVA may result from Iran's high level of inflation, which causes increase in cost of capital, which then leads to decrease in REVA. This result is to a great extent consistent with Kaminsky et al. (2003), who found a negative and significant relationship between inflation and EVA.

Based on the fifth model, it is found that the effect of GDP on ROA is positive and significant, which supports the fifth hypothesis. This result is indicated by the correlation matrix. The positive relationship that GDP has with accounting-based performance measures is quite concordant with the results given in previous papers (Baños-Caballero et al., 2012; Deloof, 2003; Juan García-Teruel & Martínez-Solano, 2007). It can be concluded that firms can take advantage of favorable economic conditions and improve their profitability. Moreover, in conditions of prosperity, customers could enjoy higher incomes per capita, which results in a significant and positive influence on demand (Jackson, 1984) and thus on firm profitability. However, unlike the previous model, GDP does not show a significant influence on REVA (based on the sixth model), which does not support the sixth hypothesis. The finding regarding the relationship between GDP and REVA is subject to some doubt. The several conflicting effects that influence the relationship between GDP and REVA (as a proxy of economics-based performance and firm value) could explain the insignificance of this relationship.



Because of the insignificance of interaction components in the seventh, eighth, ninth and tenth models, inflation and GDP do not have moderating effects or any indirect influence on the relationship that CCC has with ROA and REVA, which shows no support for the seventh, eighth, ninth, and tenth hypotheses. The insignificance of the interaction components of inflation and GDP is accounted for by the idea that the Iran's inflation rate and economic performance have no significant influence on the Iranian manufacturing WCM policies, which was indicated, to a certain extent, by previous studies, such as Yenice (2015), Baños-Caballero et al. (2010), Abbadi and Abbadi (2013) and Nyeadi et al. (2018). This claim also has been empirically examined (un-tabulated results)<sup>3</sup>. In contrast with the strand of previous empirical studies and theoretical foundations that confirmed the significant relationship between inflation and GDP with WCM, the empirical result of this study shows that the WCM and the relevant policies of listed Iranian manufacturing firms are not influenced by economic performance (GDP) and inflation, or such influences are not strong enough to moderate the influence of WCM on firm performance. The results probably support the idea that management of working capital within Iranian manufacturing firms is more influenced by the firms-level (internal) factors. In support of this claim, Anvari Rostami et al. (2014) argued that there exist significant association between several firm-level factors (such as the leverage, capital investments and operating cash flow) and WCM of listed Iranian manufacturing firms. The impact of the factors on WCM also has been widely documented and confirmed in previous studies (e.g., firm size, sales growth, proportion of intangible assets (Mongrut, Fuenzalida O'Shee, Cubillas Zavaleta, & Cubillas Zavaleta, 2014); firm size, growth opportunities and leverage (Zariyawati et al., 2010); firm size, future sales growth; board composition, executive compensation and CEO ownership (Kieschnick, Laplante, & Moussawi, 2006); firm size, firm age, profitability, operation cycles, sales growth and leverage (Nyeadi et al., 2018) and firm age, firm performance, firm value, operating cash flow and growth opportunities (Moussa, 2019).

#### 4.2. Robustness and endogeneity

Previous work has found that there may be an endogeneity problem in the relationship between WCM and firm performance (Deloof, 2003; Juan García-Teruel & Martínez-Solano, 2007; Pais & Gama, 2015). To check for possible endogeneity, two-stage least squares with robust standard errors is used. Following previous studies, the most common instrumental variables are taken to be the first lag of WCM indices, such as AR, INV, AP, and CCC (Juan García-Teruel & Martínez-Solano, 2007; Lyngstadaas & Berg, 2016; Pais & Gama, 2015). Therefore, the first lag of AR, INV, AP, and CCC was used as instrumental variables in the models.

The finding of the first model shows that all results are similar to those in Table 4. Therefore, it appears that no endogeneity problem exists for the selection of an accounting-based performance measure, and the first hypothesis is strongly supported. Considering the problem of endogeneity in the second model and controlling for it, CCC does not significantly affect the economics-based performance measure (REVA); therefore, while the endogeneity problem is controlled, the second hypothesis is nevertheless not supported. The existing theoretical framework and the results given in Table 4 indicate that CCC evidently affecting economics-based performance negatively. However, when the possible influence of economics-based performance on CCC is controlled, the results fail to be significant. Thus, when economics-based performance is weaker on average, firms tend to provide more credit and extend terms of payment to customers. Likewise, when firms encounter declines in sales and weaker performance, their inventory levels rise. Further, firms that have weaker performance may accelerate payments to avoid deferment penalties. As a result, weaker economic performance, which may be due to higher costs of capital, can lead to longer CCC and a liquidity problem.

#### 5. Conclusion and further study

WCM is an important tool for daily functioning in corporations; it helps firms balance their current assets and liabilities. The influence of WCM is investigated here in relation to the performance of 111 listed Iranian manufacturing firms in 2010–2016. OLS regression is used with robust standard

Table 4. OLS regression results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	ROA	REVA	ROA	REVA	ROA	REVA	ROA	REVA	ROA	REVA
CCC	-0.00018*** (-6.10)	-0.00026** (-2.04)					-0.00025*** (-4.73)	-0.0012* (-1.87)	-0.00033** (-2.44)	0.00017 -0.18
Inflation			0.0023***	-0.0134***			0.0014***	-0.024***		
GDP			-6.57	(-2.69)	3.25 × e-13***	1.83 × e-13***	-2.61	(-2.13)	2.42 × e-13***	3.09 × e-13
CCC*Inflation					-6.9	-0.59	3.19 × e-6	4.8 × e-5	-3.4	-0.54
CCC*GDP							-1.46	-1.51		
Leverage	-0.393*** (-12.43)	-0.373*** (-2.65)	-0.37*** (-11.30)	-0.326** (-2.41)	-0.374*** (-11.69)	-0.224 (-1.62)	-0.402*** (-12.26)	-0.386*** (-2.60)	-0.406*** (-12.61)	-0.247 (-1.58)
Cash flow	0.109*** -4.32	-0.127 (-1.24)	0.1055*** -3.5	-0.176* (-1.77)	0.1055*** -3.53	-0.224** (-2.29)	0.118*** -4.72	-0.145 (-1.33)	0.119*** -4.74	-0.217** (-2.23)
Size	0.0433*** -5.26	-0.307* (-1.70)	0.0338*** -4.04	-0.283 (-1.6)	0.0438*** -5.12	-0.27 (-1.49)	0.0321*** -4.18	-0.287 (-1.63)	0.0417*** -5.29	-0.273 (-1.5)
CLR	-0.039 (-1.26)	0.16 -0.53	-0.0267 (-0.83)	0.183 -0.62	-0.04 (-1.24)	0.36 -1.23	-0.0483*** (-1.54)	0.164 -0.56	-0.0592* (-1.90)	0.336 -1.15
CAR	0.108** -2.56	0.0968 -0.13	0.0558 -1.28	0.104 -0.14	0.0887* -1.96	0.064 -0.08	0.087** -2.2	0.196 -0.27	0.118*** -2.86	0.076 -0.1
FFA	-0.132*** (-3.22)	0.202 -0.3	-0.127*** (-2.97)	0.25 -0.37	-0.114** (-2.57)	0.345 -0.49	-0.157*** (-4.01)	0.218 -0.33	-0.144*** (-3.52)	0.312 -0.44
Firm age	-0.017* (-1.96)	0.05 -0.45	-0.04*** (-4.54)	0.05 -0.47	-0.032*** (-3.59)	0.0744 -0.67	-0.0267*** (-3.02)	0.0742 -0.66	-0.019** (-2.12)	0.0843 -0.74

(Continued)

Table 4. (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	ROA	REVA	ROA	REVA	ROA	REVA	ROA	REVA	ROA	REVA
VNOI	0.121***	0.249	0.0908***	0.159	0.0765**	0.076	0.146***	0.269	0.135***	0.115
	-3.81	-1.32	-2.96	-0.89	-2.56	-0.43	-4.54	-1.44	-4.23	-0.72
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	No	No	No	No	No	No	No	No
Adj. R-squared	0.6278	0.1083	0.5691	0.0789	0.571	0.0617	0.6072	0.0863	0.6091	0.0624

\* \*\*, and \*\*\*: Significant at 90%, 95% and 99%, respectively.

**Table 5. Endogeneity test with robust standard errors**

Regression model	Model 1 (ROA as a dependent variable)		Model 2 (REVA as a dependent variable)	
	Coefficient	Z-statistics	Coefficient	Z-statistics
	CCC	-0.00021***	-6.17	-0.0002
Leverage	-0.396***	-12.61	-0.367***	-2.64
Cash flow	0.111***	4.51	-0.130	-1.29
Size	0.0428***	5.31	-0.306*	-1.72
CLR	-0.0420	-1.38	0.165	0.56
CAR	0.111***	2.67	0.092	0.13
FFA	-0.136***	-3.40	0.208	0.31
Firm age	-0.0159*	-1.8	0.047	0.43
VNOI	0.127***	4.04	0.238	1.27
Industry dummies	Yes		Yes	
Year dummies	Yes		Yes	
Adjusted R-squared	0.6273		0.1083	

\*, \*\* and \*\*\*: Significant at 90%, 95% and 99%, respectively.

errors to assess the results. This study is an exciting first step in understanding the moderating role of macroeconomic factors in the relationship between WCM and firm performance. The significant and negative relation between CCC and ROA shows WCM's link to a typical example of the risk-return nature of financial decision-making (Yazdanfar & Öhman, 2014); thus, the adoption of an aggressive strategy contributes to the improvement of accounting-based performance. To achieve this, the credit granted to customers should be limited, inventories should be minimal, only to the extent that needs are met, and bill payments should be stretched. Further, in the primary analysis, CCC is negatively and significantly related to REVA; however, when the endogeneity problem is controlled, this relationship lost its significance. As a result, WCM policies, which are related to short time periods, do not have significant influence on firm value or long-term performance.

The direct role of macroeconomic factors is also analyzed, and it is found that the effects of inflation and GDP on ROA are positive and significant. The implication can be drawn here that because macroeconomic conditions have a significant influence on accounting-based performance, executives, besides internal and controllable factors, must consider macroeconomic conditions as they draft their decisions, policies, and actions. For example, when firms are operating in high-performing economic conditions (high levels of GDP), they should employ aggressive strategies to attract more customers, improve turnover, and take advantage of general prosperity, to generate more sales and thus, greater profitability. Further, inflation threatens firms as they increase expenditures and reduce the purchasing power of customers. However, executives must employ techniques, such as cost management, to keep expenditures at a moderate level and employ motivational policies (such as efficient rebates) to maintain sales levels. Of the two macroeconomic variables reviewed, only inflation was significantly associated with REVA. Thus, financial executives are recommended to pay close attention to measures of inflation, which has a significant influence on both short-term performance and the ability of firms to generate value. Additionally, when macroeconomic factors (as moderating components) are introduced to the models, they do not moderate the influence of WCM on firm performance. As mentioned in Section 4, it is expected that the WCM of Iranian firms is more influenced by firms-level factors, such as board composition, executive compensation, CEO ownership, firm size, operating cash flow, leverage, and other relevant factors, which conclusion, to a great extent, is supported by previous work (e.g., Rostami et al., 2014; Kieschnick et al., 2006; Zariyawati et al., 2010).

Because this study takes place in an environment where the rate of inflation is high, practitioners and researchers should be cautious in generalizing these results. Moreover, we did not perform any tests for endogeneity of the relationship between macroeconomic and firm performance as a robust test, as no theoretical results have indicated the possibility that endogeneity is a problem in this relationship, and it is unclear what instrumental variables should be used to test it. It is recommended, future researchers evaluate the existence of endogeneity problem in this relationship.

The results of this study have important theoretical and practical implications. Theoretically, this study, which examines the association between WCM and economics-based performance measure (REVA) and the moderating role of macroeconomic variables (inflation and GDP) in the WCM–performance relationship, enhancing the WCM literature and providing an opportunity for future researchers. Prospective researchers are able to research about the influence of WCM on the other economics-based performance. Also, by examining the relationship between macroeconomic factors (inflation and GDP) and economics-based performance measure (REVA), we signal to future researchers that macroeconomic factors not only affect accounting indicators but also can affect long-term performance indicators.

Also, the findings of this study have important practical (managerial) implications; firstly, managers should pay close attention to changes in economic conditions, because the results of this study show that the economy condition (GDP) has significant and positive influences on both short-term and long-term firm performance (firm value). In addition, the inflation with REVA has a negative and significant relationship; the authors argue that much of this impact may be due to the impact of inflation on capital structure and cost of capital, which affects the long-term performance. In this regard, Tehrani and Najafzadeh Khoi (2017) in a study in an Iranian environment stated that high inflation can lead to an increase in the cost of capital. Therefore, adjustments to capital structure with respect to inflation may seem necessary. Finally, it is specifically suggested to Iranian managers that by reducing their cash conversion cycle, they can increase their short-term performance.

It is highly recommended that future researchers evaluate the moderating role of GDP and inflation rate in other countries that feature different overall conditions (such as countries with low rates of inflation) and compare those results with the evidence given in this paper. This will contribute to an understanding of the role that macroeconomic variables can play for WCM and firm performance. Furthermore, researchers can go further and evaluate the moderating role of other macroeconomic factors on this relationship and expand the literature of macroeconomic factors regarding WCM.

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#### Author details

Iman Soukhakian<sup>1</sup>  
E-mail: [Soukhakian.iman@ut.ac.ir](mailto:Soukhakian.iman@ut.ac.ir)  
ORCID ID: <http://orcid.org/0000-0002-8637-3347>  
Mehdi Khodakarami<sup>1</sup>  
E-mail: [mehdi.khodakarami@ut.ac.ir](mailto:mehdi.khodakarami@ut.ac.ir)  
ORCID ID: <http://orcid.org/0000-0002-3301-2636>  
<sup>1</sup> Department of Accounting, University of Tehran, Tehran, Iran.

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#### Notes

1. Market value of total assets equals to the market value of equity plus the book value of liabilities. Since, there is not an active market for liabilities in Iran and majority of liabilities are current (87%), it is presumed that the book value of liabilities can be a good proxy for the market value of it. Page 12.
2. In regression analysis, in order to have better comparable coefficients in the second model (in comparison with the first one) and scale both dependent and explanatory variables, the standardized form of REVA has been used in the analysis. Since a considerable part of the variable is negative, it was not practical to use the natural logarithm of it, which could impose a sample size problem. Page 14.
3. In support of this, two regression models are implemented, in which the independent variables are macroeconomic factors and the dependent variable is CCC. The results confirm that macroeconomic factors

are not significantly associated with CCC (untabulated results, Page 17).

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