

Effects of the 2008 Financial Crisis on the Working Capital Management Policy of U.S. Enterprises

Chong-Chuo Chang

*Department of Banking and Finance, College of Management,
National Chi Nan University, Taiwan (R.O.C.)*

Tai-Yung Kam

*International College,
Guangzhou College of Commerce, China*

Yu-Cheng Chang*

*Department of Leisure and Recreation Management, College of Management
Asia University, Taiwan (R.O.C.)*

Chen-Chen Liu

*Department of Finance, College of Management,
Asia University, Taiwan (R.O.C.)*

Abstract

The literature has not extensively examined the effects of the 2008 financial crisis on the working capital management of U.S. enterprises. That economic turmoil may have caused enterprises to encounter a lack of funds owing to the severe credit crunch, financial constraints, poor liquidity, and other factors, thereby adversely affecting their working capital management policies. This study thus investigates the effects of this global crisis on the working capital management policy of U.S. enterprises using panel data regression with fixed effects. Results reveal no significant effect on the cash conversion cycle (CCC), implying that a financial crisis has no effect on the speed of working capital collection. However, firms with relatively low current and quick ratios during and after a financial crisis period should pay more attention to their liquidity management strategies or take actions prior to the eruption of a crisis so as to prevent themselves from slipping into a liquidity crisis that in turn weakens their financial situation and leads to financial difficulties.

Keywords: working capital management policy; financial crisis; liquidity management policy

JEL classifications: G30; G32; G01

Received January 4, 2019, revised April 29, 2019, accepted September 18, 2019.

*Correspondence to: Department of Leisure and Recreation Management, Asia University, 500, Lioufeng Rd., Wufeng, Taichung 41354, Taiwan (R.O.C.). E-mail: yuchen@asia.edu.tw.

1. Introduction

Did the 2008 financial crisis affect the working capital management policy of U.S. enterprises? On Nov. 2, 2009, the Wall Street Journal suggested that cash holdings during the financial crisis were significantly higher than those at any time in the past 40 years, as evidenced by the highest cash asset ratio. The bankruptcy of Lehman Brothers in September 2008 resulted in a global credit crunch. With the spread of the economic collapse throughout the world, the global unemployment rate significantly increased. Many studies investigate and advocate the importance of liquidity management strategies for a firm during a financial crisis (Tong and Wei, 2008; Ivashina and Scharfstein, 2010; Duchin *et al.*, 2010; Campello *et al.*, 2010; Campello *et al.*, 2011; Shirasu, 2012; Maksimovic *et al.*, 2015; Haron and Nomran, 2016; Nia and Mansoori, 2016; Raykov, 2017a, 2017b; Oseifuah, 2018; Tsuruta, 2019). Ivashina and Scharfstein (2010) assert that banks sharply slashed credits for new loans and were unwilling to offer new loans during the financial crisis; hence, market liquidity and economic activities were significantly curtailed at that time. Some countries (such as Greece, Iceland, Italy, Ireland, Portugal, and Spain) even experienced a serious recession due to the global financial storm. All these unfortunate events prove that the 2008 financial crisis certainly affected the working capital management policy of U.S. enterprises.

Previous related literature mostly focuses on investments, financing and dividends, and other long-term financial decisions, disregarding the short-term working capital management of firms. On the other hand, a few studies do verify the importance of working capital management. Smith (1980) argues that working capital management significantly influences the profitability and operating risks of enterprises. Reason (2004) emphasizes that a working capital management policy is exceedingly important. However, a considerable amount of research has specified that working capital management negatively correlates with the operating performance of enterprises (Jose *et al.*, 1996; Shin and Soenen, 1998; Wang, 2002; Deloof, 2003; Lazaridis and Tryfonidis, 2006; Garcia-Teruel and Martinez-Solano, 2007; Baños-

Caballero *et al.*, 2010). Wilner (2000) and Ng *et al.* (1999) suggest that if a company intends to shorten its cash conversion cycle (CCC), then it should reduce its risk of bad debts and accounts receivable costs, thereby enhancing its overall performance. In contrast, Jose *et al.* (1996) reveal that a long CCC can be detrimental to a company's operating performance. Al-Rahahleh (2016) suggests that CCC negatively relates to governance quality, which reflects positively on the efficiency of working capital management. Zeidan and Shapir (2017) demonstrate that CCC is significantly negatively associated with firms' profitability, whereas reductions in the cycle should increase shareholder value. Nwude *et al.* (2018) indicate that CCC has a significant negative effect on return on total assets (ROA). Chang (2018) indicates a negative relationship between CCC and firm performance, supporting that an aggressive working capital policy can enhance firm performance; however, this effect diminishes or reverses when firms exist at the lower CCC level. However, Zakari and Saidu (2016) reveal a significant positive relationship between CCC and corporate profitability. Therefore, understanding the effects of CCC is an important issue.

The effects of the 2008 financial crisis on U.S. firms' working capital management have yet to be widely investigated. This economic turmoil may have caused enterprises to come across a lack of funds owing to credit crunch, financial constraints, poor liquidity, and other factors, thereby adversely affecting their working capital management policies. Prowse (1998), Rajan and Zingales (1998), Kashyap *et al.* (2009), Hart and Zingales (2009), Acharya *et al.* (2010), and Radić *et al.* (2012) state that enterprises all over the world have begun to focus on their respective working capital management after the global financial crisis. Considering that this financial crisis greatly affected many financial systems during this current era of economic liberalization, this study investigates its effects on the working capital management of U.S. enterprises. The empirical results offer practical contributions to firms, individual investors, and authorities as a reference for dealing with a financial crisis.

The results clearly reveal that a financial crisis has no significant effect on CCC, which implies that it has no effect on the rate of return of overall working capital.

However, firms with relatively low levels of a current ratio and a quick ratio denote their low capability of paying back short-term debts. Therefore, firms should pay more attention to their liquidity management during a financial crisis.

The rest of the paper runs as follows. Section 2 is the literature review, which discusses the effect of a financial crisis on working capital strategies. Section 3 explains the data source, econometric model, and variables. Section 4 presents the empirical results. Finally, section 5 offers concluding remarks.

2. Literature Review

Many studies investigate and advocate the importance of liquidity management strategies for a firm during a financial crisis (Tong and Wei, 2008; Ivashina and Scharfstein, 2010; Duchin *et al.*, 2010; Campello *et al.*, 2010; Campello *et al.*, 2011; Shirasu, 2012; Maksimovic *et al.*, 2015; Haron and Nomran, 2016; Nia and Mansoori, 2016; Raykov, 2017a, 2017b; Oseifuah, 2018; Tsuruta, 2019). Among them, Ivashina and Scharfstein (2010) reveal during a financial crisis that firms have more difficulty raising necessary capital through banking systems. Campello *et al.* (2010) suggest that no matter whether a firm has or does not have financial constraints, its liquidity management strategies will be significantly affected by a financial crisis. Duchin *et al.* (2010) find that firms, especially those with a low level of liquidity, suffer seriously from a financial crisis. Campello *et al.* (2011) highlight a tradeoff between the level of cash holdings and investment planning for firms with low credit lines. Ang and Smedema (2011) even suggest that most firms do not hold enough reserves in case of a future recession. Shirasu (2012) demonstrates that given the 2008 U.S. subprime crisis was only impacted by market liquidity, whereas the 1990 Japanese-orientated crisis was influenced by market liquidity and funding liquidity, no true comparisons can be made regarding the financial crisis liquidity effects between the two events.

Maksimovic *et al.* (2015) demonstrate during a liquidity crunch that even unrated firms with high demand are predicted to have high liquidity opportunity costs. This would suggest that, during a financial crisis, even such firms are susceptible to insufficient short-term or self-financing to maintain company growth objectives. Capital management throughout a financial crisis has been described by Haron and Nomran (2016) as being affected by free cash flow during a crisis, but it is only impacted by debt before and after; profitability and firm size are always influencing factors regardless of whether there is a crisis. Nia and Mansoori (2016) find that there is a tendency to reduce the amount of investment operations and liquid working capital during a financial crisis due to a company's financial constraints. However, this reduction could jeopardize liquidity and result in a cost mark-up in external financing. To mitigate these effects, a firm's working capital management should be optimized by managers during a financial crisis.

As exemplified by the 2008 global financial crisis' stress on the importance of working capital management, due to existing liquidity crunches and difficulty accessing outsider capital, firms must re-evaluate their analysis of current assets financing (Raykov, 2017a). Therefore, it is strongly recommended to again assess the important role that liquidity management plays and its effects on maximizing company objectives during periods of financial crisis (Raykov, 2017b). That study also demonstrates a negative correlation between controllable liquidity and operational profitability in the long term. With regards to considerable variations in profitability, volatility in liquidity is relatively low and poor. Based on Oseifuah's (2018) findings, there is a strong negative correlation between the accounts receivable conversion period and profitability during a financial crisis. Tsuruta (2019) finds that following the collapse of Lehman Brothers in 2008, greater excess working capital was held by firms, resulting in a slower adjustment during the time of the financial crisis. Additionally, firms' profitability declined due to excess held capital, which was further exacerbated amidst the crisis.

Working capital management involves short-term debt repayment ability. During a financial crisis, if a firm's working capital management is not sound, then it may

lead the firm into a liquidity crisis, which in turn increases the chance of becoming bankrupt. Therefore, this paper investigates the effect of a financial crisis on the variables of working capital management. The results can be used as reference for firms to manage their working capital during a financial crisis.

3. Research Methods

3.1 Data Sources

We employ U.S.-listed companies as the research sample. To strengthen the reliability of the empirical results, the study period is from 1990 to 2014, covering a total of 25 years. Due to differences in industrial characteristics from other industries and regulatory restrictions, we exclude both the financial (SIC codes in the range of 6000–6999) and the utility industries (SIC codes in the range of 4900–4999). In addition, this study also cuts off both the top and bottom one percentiles of all the regression variables to eliminate outliers. The financial statements and market data of the sample companies are obtained from the Worldscope database.

3.2 Empirical Model

Following Baños-Caballero *et al.* (2010), we construct panel data regression by combining cross-section materials to investigate the effects of the 2008 financial crisis on the working capital management policy of U.S. enterprises. The model is:

$$\begin{aligned}
 WCM_{i,t} = & \alpha_0 + \beta_1 Crisis(AfterCrisis)_{i,t} + \beta_2 ROA_{i,t} + \beta_3 GROWTH_{i,t} \\
 & + \beta_4 STDROA_{i,t} + \beta_5 CF_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 FA_{i,t} \\
 & + Firm\ dummies + \varepsilon_{i,t}
 \end{aligned} \quad (1)$$

Here, subscript i represents a sample firm, t represents a year, and WCM represents working capital management variables. WCM and the other independent variables in equation 1 are described as follows.

3.3 Working Capital Management Variables

Considering the method described in Baños-Caballero *et al.* (2010) and Shin and Soenen (1998), this study measures the working capital management variables, including CCC, days receivables outstanding (R_day), days inventory outstanding (I_day), days payables outstanding (P_day), current ratio ($Current_R$), and quick ratio ($Quick_R$). Here, CCC is equal to the sum of the days' sales of accounts receivable and the days' sales of inventory minus the delayed days of accounts payable; R_day is equal to 365 divided by the accounts receivable turnover; I_day is equal to 365 divided by inventory turnover; P_day is equal to 365 divided by the accounts payable turnover; $Current_R$ refers to the current ratio divided by the current liabilities; and $Quick_R$ is equal to quick assets divided by the current liabilities.

Following Baños-Caballero *et al.* (2010), Chiou *et al.* (2006), Core *et al.* (2006), and Deloof (2003), this study considers the rate of the return on total assets (ROA), growth opportunity ($GROWTH$), profit volatility ($STDROA$), cash flow rate (CF), company size ($SIZE$), financial leverage (LEV), fixed assets (FA), and other control variables. ROA refers to the ratio of net profit to average assets; $GROWTH$ is equal to the sales income of the current period minus that of the previous period divided by the sales income of the previous period; $STDROA$ refers to the standard deviation of the rate of ROA in the last five years; CF equals the sum of net profit plus depreciation and amortization expenses divided by total assets; $SIZE$ is a natural logarithm taken from sample firms' share prices multiplied by the number of outstanding shares; LEV refers to the ratio of total liabilities to total assets; and FA refers to the ratio of the book value of fixed assets to total assets. Based on the result of the Hausman test, the panel data regression model of this study is a fixed effect model; thus, the heterogeneity of all the sample companies is considered. The fixed effect (*Firm dummies*) variables of the targeted companies are added to Eq. (1).

3.4 Financial Crisis Variables

This study adopts two financial crisis variables: *Crisis* and *AfterCrisis*. *Crisis*

is the dummy variable set to 1 for during the crisis from 2007 to 2008 and otherwise 0. *AfterCrisis* refers to the dummy variable after the financial crisis and is set to 1 after 2009 and otherwise 0.

4. Empirical Results

4.1 Distribution of the Sample Industries and Industrial Working Capital Management Variables

As shown in Table 1, the research sample includes a total of 1,172 companies. Among this sample, companies in the business service sector account for the largest portion (14.68%), totaling 172 companies, followed by companies from the communications sector (9.98%) and the medical equipment sector (8.19%). Regarding the observation value, we obtain a total of 12,920 company/annual observation values. The value in the business service sector is the highest at 2,188 company/annual observation values (16.93% of the total sample), followed by the information technology sector (7.00%) and the communications sector (6.75%).

Table 1. Distribution of the Sample Industries and Working Capital Management Variables

Industry	Number of firm-	Percentage	Number of firms	Percentage	<i>R_day</i>	<i>L_day</i>	<i>P_day</i>	<i>CCC</i>	<i>Current_R</i>	<i>Quick_R</i>
Agriculture	102	0.79%	9	0.77%	48.5882	138.4610	30.1430	156.9060	3.4143	2.0810
Food Products	298	2.31%	22	1.88%	34.0000	70.7650	29.8130	74.9520	3.2671	1.9364
Candy & Soda	96	0.74%	8	0.68%	33.5625	67.1770	37.2780	63.4620	2.3123	1.3589
Beer & Liquor	26	0.20%	3	0.26%	29.3846	239.4230	46.1030	222.7050	2.9831	1.0965
Tobacco Products	177	1.37%	11	0.94%	68.6610	98.6100	42.5940	124.6770	2.9249	1.8605
Recreation	108	0.84%	12	1.02%	34.2407	46.9540	58.5930	22.6010	1.6005	1.1644
Entertainment	64	0.50%	7	0.60%	56.5156	165.4380	142.6500	79.3030	3.2089	2.0211

Table 1. (cont'd)

Printing and Publishing	369	2.86%	27	2.30%	53.1572	98.2570	41.2440	110.1710	3.4005	2.0571
Consumer Goods	147	1.14%	10	0.85%	54.5374	108.9860	34.5600	128.9630	4.3957	2.1961
Apparel	48	0.37%	6	0.51%	44.4167	21.2080	34.2560	31.3690	2.4704	2.0081
Healthcare	855	6.62%	80	6.83%	64.0690	165.9520	66.0790	163.9420	4.3227	3.1549
Medical equip.	745	5.77%	96	8.19%	60.3919	179.1340	115.4690	124.0570	4.4460	3.6112

Pharmaceutical Products	166	1.28%	15	1.28%	54.9819	70.6510	43.6420	81.9900	3.1803	2.2275
Chemicals	137	1.06%	11	0.94%	57.9270	70.1750	38.6060	89.4960	3.1526	2.1826
Rubber and Plastic Products	60	0.46%	3	0.26%	50.8167	90.3500	31.9100	109.2560	2.7043	1.1895
Textiles	252	1.95%	21	1.79%	42.0873	61.2100	25.8330	77.4650	2.9189	1.7023
Construction Materials	103	0.80%	10	0.85%	63.5437	50.5830	38.9620	75.1640	2.5379	1.6125
Construction	265	2.05%	23	1.96%	54.2792	91.2490	33.6470	111.8810	3.1634	1.6028
Steel Works etc.	50	0.39%	5	0.43%	65.2400	180.3800	116.2500	129.3700	1.7384	1.1134
Fabricated Products	599	4.64%	43	3.67%	67.3856	139.1740	45.0610	161.4980	3.3437	2.0786
Machinery	295	2.28%	26	2.22%	76.7831	101.4920	59.3920	118.8830	3.2851	2.3234
Electrical Equip.	259	2.00%	21	1.79%	70.6950	75.8460	56.2530	90.2880	3.0317	2.0703
Automobiles and Trucks	71	0.55%	5	0.43%	69.0423	119.5770	39.1230	149.4970	3.2561	1.8152
Aircraft	15	0.12%	2	0.17%	18.5333	64.1330	32.0370	50.6300	4.2473	3.1447
Shipbuilding	28	0.22%	4	0.34%	55.5000	52.5000	43.2090	64.7910	2.3118	1.6186
Defense	34	0.26%	4	0.34%	71.3529	118.3820	46.9630	142.7720	5.7188	4.7353

Table 1. (cont'd)

Precious Metals	21	0.16%	3	0.26%	51.5714	49.9050	54.7770	46.6990	2.2271	1.6157
Mining	42	0.33%	4	0.34%	33.9048	23.0710	44.0070	12.9690	1.5300	1.1945
Coal	127	0.98%	21	1.79%	65.1260	18.6140	109.6120	-25.8720	2.4634	2.1733
Petroleum and Natural Gas	319	2.47%	46	3.92%	61.3135	40.5490	79.9130	21.9490	2.1437	1.7669
Utilities	79	0.61%	8	0.68%	31.7975	56.9240	37.1200	51.6010	2.0432	1.1971
Communications	872	6.75%	117	9.98%	65.3830	56.6860	83.4690	38.6000	3.0238	2.5575
Personal Services	708	5.48%	53	4.52%	67.3757	67.9580	64.7040	70.6290	3.5805	2.9089
Business Services	2,188	16.93%	172	14.68%	61.2221	104.5130	59.9180	105.8180	4.3894	3.3855
Computers	904	7.00%	59	5.03%	74.6515	151.8760	49.0820	177.4450	4.4643	3.1580
Electronic Equip.	60	0.46%	3	0.26%	51.6000	121.0170	56.8550	115.7620	2.4105	1.1382
Measuring Equip.	12	0.09%	1	0.09%	26.8333	61.1670	41.6270	46.3730	1.6542	0.6800
Business Supplies	422	3.27%	45	3.84%	40.3981	21.8650	39.0820	23.1810	1.8515	1.4375
Shipping Containers	589	4.56%	44	3.75%	49.1273	88.1680	40.4820	96.8130	2.5627	1.3496
Transportation	802	6.21%	73	6.23%	19.1334	82.9290	42.3950	59.6670	2.3795	1.0945
Wholesale	406	3.14%	39	3.33%	14.2266	23.4510	32.0440	5.6330	1.3422	0.9490
SUM	12,920	100.00%	1,172	100.00%						
MEAN					51.5453	89.1405	52.7990	87.8867	2.9610	1.9651

4.2 Difference in the Working Capital Management Variables between the Financial and Non-Financial Crisis Periods

This study investigates the difference in the working capital management variables between the financial and non-financial crisis periods. For this analysis, the samples are divided into non-financial and financial crisis groups. As shown in Table 2, during the non-financial crisis period, *CCC*, *Current_R*, and *Quick_R* of the firms are 97.8381, 3.4992, and 2.4842, respectively; during the financial crisis period they are 92.6342, 3.3402, and 2.3672, respectively. The differences in these variables are -5.2039, -0.1590, and -0.1170, which are all significant at the 5% level. This finding indicates that *CCC* and liquidity of the firms declined during the financial crisis.

This study also examines the difference in working capital management before and after the financial crisis. For this analysis, the samples are divided into groups for before and after the financial crisis. Before the financial crisis, *Current_R* and *Quick_R* of the companies are 3.4992 and 2.4842, respectively, but are 3.2873 and 2.3184 after the crisis, respectively. The differences in these variables are -0.2119 and -0.1658, which are significant at the 1% level. This finding indicates that the enterprise asset liquidity of the firms declined after the 2008 financial crisis.

Table 2. Difference in Working Capital Management Variables Between the Financial and Non-Financial Crisis Periods

Panel A: Difference in Working Capital Management Variables between Financial and Non-Financial Crisis Periods				
	Non-Financial Crisis	Financial Crisis	Difference	p-value
<i>R_day</i>	56.5327	54.9224	-1.6103**	0.0399
<i>I_day</i>	97.6749	94.3690	-3.3059*	0.0786
<i>P_day</i>	56.3695	56.6572	0.2877	0.4406
<i>CCC</i>	97.8381	92.6342	-5.2039**	0.0332
<i>Current_R</i>	3.4992	3.3402	-0.1590**	0.0192
<i>Quick_R</i>	2.4842	2.3672	-0.1170**	0.0463

Panel B: Difference in Working Capital Management Variables between Before and After the Financial Crisis				
	Before the Financial Crisis	After the Financial Crisis	Difference	p-value
<i>R_day</i>	56.5327	55.5608	-0.9719*	0.0592
<i>I_day</i>	97.6749	99.9902	2.3153*	0.0851

<i>P_day</i>	56.3695	58.5320	2.1625**	0.0419
<i>CCC</i>	97.8381	97.0189	-0.8192	0.3382
<i>Current_R</i>	3.4992	3.2873	-0.2119***	0.0000
<i>Quick_R</i>	2.4842	2.3184	-0.1658***	0.0004

*significant at 10% level; **significant at 5% level; ***significant at 1% level.

4.3 Description of the Statistics

As shown in Table 3, the mean value of *R_day* is 55.9596 in the entire sample, implying that U.S. enterprises on average received a loan approximately 56 days after the financial crisis. The mean value of *I_day* is 98.1922, indicating that U.S. enterprises sold a batch of their goods on the stock market after about 98 days. The mean value of *P_day* is 57.2534, denoting that U.S. enterprises paid a sum of money after nearly 57 days. The mean values of *Current_R* and *Quick_R* are 339.70% and 240.52%, respectively; both are higher than 1. This result suggests that U.S. enterprises had sufficient current and quick assets to repay their current liabilities.

Table 3. Description of the Statistics

Variable	Mean	Median	Std. Dev	1 st	5 th	25 th	50 th	75 th	99 th
<i>R_day</i>	55.9596	53	32.8373	3	6	38	70	112	175
<i>I_day</i>	98.1922	79	87.7770	2	7	39	131	254	437
<i>P_day</i>	57.2534	41.8111	66.3838	8.3159	14.4529	28.1830	61.7440	145.3446	334.4746
<i>CCC</i>	96.8984	86.9085	102.7336	-140.4396	-20.4352	40.9019	142.2342	265.2088	408.0053
<i>Current_R</i>	3.3970	2.5500	2.8726	0.5400	0.9300	1.7100	4.0900	8.4200	14.9300

Table 3. (cont'd)

Variable	Mean	Median	Std. Dev	1 st	5 th	25 th	50 th	75 th	99 th
<i>Quick_R</i>	2.4052	1.5800	2.5956	0.1500	0.4100	0.9600	2.8700	6.9500	12.9300
<i>GROWTH</i>	0.0999	0.0874	0.2483	-0.6009	-0.2872	-0.0177	0.2063	0.5137	0.8992
<i>STDROA</i>	0.0909	0.0540	0.1074	0.0052	0.0093	0.0255	0.1144	0.2948	0.5268
<i>CF</i>	0.0441	0.0789	0.1693	-0.6858	-0.2963	0.0227	0.1311	0.2183	0.2840
<i>SIZE</i>	12.4755	12.4216	1.7968	8.8394	9.6139	11.1693	13.6451	15.7107	16.8480
<i>LEV</i>	0.1616	0.1049	0.1779	0	0	0.0010	0.2717	0.5247	0.6859
<i>FA</i>	0.2329	0.1708	0.2003	0.0118	0.0275	0.0822	0.3199	0.6789	0.8425

4.4 Effect of Crisis on CCC

The empirical results in Table 4 indicate that crisis significantly negatively affected R_day - that is, the days' sales of accounts receivable showed a declining trend. In contrast, the crisis significantly affected I_day , implying that the sales of shares by the firms increased during the financial crisis. The empirical results reveal that firms have lower days' accounts receivable and days' sales of inventory during a financial crisis. This indicates that firms may adopt a contractive credit policy regarding their customers by shortening the payment period, promoting sales, or reducing inventory.

Firms should be aware of such a policy, which may damage relationships with customers. Low inventory may cause a supply shortage problem. Furthermore, *Crisis* shows no significant effect on CCC and P_day , indicating that a financial crisis has no effect on the speed of working capital collection and payment pressure.

Table 4. The Effects of Crisis on CCC during the Financial Crisis

Dependent Variable Independent Variable	Table 4. (cont'd)							
	R_day	I_day	P_day	CCC	R_day	I_day	P_day	CCC
<i>Intercept</i>	82.3286*** (2.0337)	163.9370*** (5.9835)	13.1501*** (4.2774)	233.1155*** (7.0012)	75.9720*** (3.1189)	188.7060*** (9.7809)	39.8982*** (6.1370)	224.7799*** (11.4014)
<i>Crisis</i>	-1.9971** (0.8429)	-6.2484*** (2.1379)	-3.9343** (1.7878)	-4.3112* (2.5955)	-1.5308*** (0.4804)	-2.8518** (1.2527)	-1.8212 (1.1621)	-2.5614 (1.5772)
<i>GROWTH</i>	-13.5650*** (1.2676)	-18.3896*** (4.0250)	-0.8750 (3.7850)	-31.0796*** (5.1165)	-16.6868*** (0.9797)	-26.5241*** (2.7320)	-15.3758*** (2.9291)	-27.8350*** (3.4922)
<i>STDROA</i>	-3.6425 (2.7017)	-1.8007 (9.1356)	84.5816*** (8.9927)	-90.0248*** (12.0627)	4.3764* (2.4705)	15.1688* (8.8051)	63.8402*** (9.1105)	-44.2951*** (11.0712)
<i>CF</i>	-26.5885*** (2.0322)	-69.9433*** (6.4119)	-99.8960*** (6.3006)	3.3641 (7.6339)	-20.2657*** (1.9698)	-36.1193*** (5.5908)	-50.4446*** (5.3455)	-5.9404 (6.5418)
<i>SIZE</i>	-0.9668*** (0.1578)	-2.8196*** (0.4501)	3.5287*** (0.3337)	-7.3150*** (0.5312)	-1.1776*** (0.2352)	-5.9217*** (0.6557)	1.1420** (0.4872)	-8.2413*** (0.7909)
<i>LEV</i>	-0.4577 (1.6224)	-16.9186*** (4.2457)	-3.7415 (3.5302)	-13.6348*** (5.0682)	3.6522** (1.7807)	-9.8928** (4.7974)	2.6692 (3.7797)	-8.9098 (5.6545)
<i>FA</i>	-47.8360*** (1.4086)	-94.5230*** (3.6713)	-8.7788*** (3.1850)	-133.5802*** (4.2764)	-26.9826*** (2.3163)	-55.8209*** (6.6513)	-11.9987** (5.7749)	-70.8049*** (7.9945)
<i>Firm dummies</i>					Included	Included	Included	Included
<i>Adjusted R²</i>	0.1355	0.0915	0.104	0.0913	0.6582	0.6567	0.5512	0.6182
<i>F-value</i>	290.17***	186.90***	215.24***	186.41***	25.71***	25.54***	16.75***	21.77***

Notes: Newey–West heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

4.5 Effect of *Crisis* on Current and Quick Ratios

The empirical results in Table 5 reveal that *Crisis* significantly negatively affected *Current_R* and *Quick_R*, indicating that the debt paying ability of the enterprises was reduced during the financial crisis. Therefore, firms should emphasize the importance of liquidity management, such as retaining more cash and reducing unnecessary or non-urgent spending, so as to avoid the possibility of a liquidity crunch.

Table 5. The Effects of *Crisis* on Current and Quick Ratios during the Financial Crisis

Dependent Variable	<i>Current_R</i>	<i>Quick_R</i>	<i>Current_R</i>	<i>Quick_R</i>
Independent Variable				
<i>Intercept</i>	4.9833*** (0.1756)	2.5111*** (0.1510)	3.3209*** (0.2494)	1.5963*** (0.2198)
<i>Crisis</i>	-0.1261* (0.0666)	-0.1398** (0.0604)	-0.1546*** (0.0471)	-0.1719*** (0.0429)
<i>GROWTH</i>	-0.3276*** (0.1266)	-0.0421 (0.1179)	-0.6423*** (0.0938)	-0.4485*** (0.0857)
<i>STDROA</i>	0.9473*** (0.2982)	2.0129*** (0.2787)	0.8597*** (0.2870)	1.3624*** (0.2636)
<i>CF</i>	0.2870* (0.1594)	-0.3856*** (0.1484)	1.5106*** (0.1847)	1.1716*** (0.1717)
<i>SIZE</i>	-0.0268** (0.0127)	0.0672*** (0.0111)	0.0935*** (0.0181)	0.1356*** (0.0161)
<i>LEV</i>	-4.2548*** (0.1272)	-3.8060*** (0.1162)	-2.9656*** (0.1638)	-2.3008*** (0.1482)
<i>FA</i>	-2.6404*** (0.1001)	-2.0341*** (0.0887)	-3.6862*** (0.1911)	-3.5669*** (0.1781)

Table 5. (cont'd)

<i>Firm dummies</i>			Included	Included
<i>Adjusted R²</i>	0.1406	0.1381	0.5336	0.5317
<i>F-value</i>	302.89***	296.72***	15.68***	15.57***

Notes: Newey–West heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

4.6 Effect of *AfterCrisis* on CCC

The empirical results in Table 6 reveal that *AfterCrisis* significantly negatively affected *R_day*, suggesting that the days' sales of accounts receivable of the enterprises decreased after the financial crisis. This indicates that firms may apply a contractive credit policy to their customers. As previously mentioned, the policy may damage customer relationships. As a result, firms should bear the risk of decreasing revenues. However, *AfterCrisis* has no significant impact on *CCC*, *I_day*, and *P_day*, indicating that *AfterCrisis* has no impact on the speed of working capital collection, sales of stock, and payment pressure. The results indicate that *AfterCrisis* only has an effect on *R_day*, and thus firms should pay more attention to accounts receivable credit policy after a financial crisis.

Table 6. The Effects of *AfterCrisis* on CCC During the Financial Crisis

Variable	Dependent							
	<i>R_day</i>	<i>I_day</i>	<i>P_day</i>	<i>CCC</i>	<i>R_day</i>	<i>I_day</i>	<i>P_day</i>	<i>CCC</i>
<i>Intercept</i>	82.5995*** (2.0298)	164.0876*** (5.9833)	13.3695*** (4.2818)	233.3176*** (6.9961)	75.5697*** (3.1262)	190.3393*** (9.7446)	39.7614*** (6.0970)	226.1476*** (11.3635)
<i>AfterCrisis</i>	-2.7203*** (0.5737)	-0.6489 (1.5682)	-1.8138 (1.1790)	-1.5555 (1.8383)	-3.0760*** (0.4126)	1.2642 (1.1359)	-2.6558*** (0.9259)	0.8440 (1.3859)
<i>GROWTH</i>	-14.2982*** (1.2776)	-18.7346*** (4.0666)	-1.4405 (3.8458)	-31.5923*** (5.1901)	-17.7553*** (0.9911)	-26.2311*** (2.7654)	-16.3194*** (2.9844)	-27.6671*** (3.5476)
<i>STDROA</i>	-2.9603 (2.6952)	-1.5465 (9.1572)	85.0778*** (9.0243)	-89.5845*** (12.0722)	4.0836* (2.4622)	15.2877* (8.7999)	63.5873*** (9.1223)	-44.2159*** (11.0716)
<i>CF</i>	-26.6673*** (2.0255)	-69.4098*** (6.3986)	-99.6994*** (6.2963)	3.6223 (7.6041)	-20.0268*** (1.9523)	-35.7313*** (5.5787)	-50.1686*** (5.3251)	-5.5895 (6.5203)
<i>SIZE</i>	-0.9185***	-2.8759***	3.5303***	-7.3247***	-1.0289***	-6.1382***	1.2481**	-8.4152***
	(0.1595)	(0.4515)	(0.3351)	(0.5335)	(0.2396)	(0.6603)	(0.4887)	(0.7952)
<i>LEV</i>	-0.2897 (1.6241)	-16.7954*** (4.2469)		-13.4931*** (5.0662)	3.5784** (1.7819)	-9.8932** (4.7986)	2.6011 (3.7805)	-8.9158 (5.6563)
<i>FA</i>	-48.0661*** (1.4151)	-94.3817*** (3.6759)	-8.8438*** (3.1897)	-133.6041*** (4.2819)	-28.3232*** (2.3494)	-55.0329*** (6.7804)	-13.1222** (5.8555)	-70.2340*** (8.1092)
<i>Firm dummies</i>					Included	Included	Included	Included
<i>Adjusted R²</i>	0.1367	0.091	0.1038	0.0912	0.6598	0.6566	0.5514	0.6181
<i>F-value</i>	293.15***	185.75***	214.80***	186.12***	25.88***	25.53***	16.77***	21.77***

Notes: Newey–West heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

4.7 Effect of *AfterCrisis* on Current and Quick Ratios

The empirical results in Table 7 reveal that *AfterCrisis* significantly negatively affected *Current_R* and *Quick_R*, suggesting that the short-term debt paying ability of the enterprises was reduced after the financial crisis. Obviously, one year after a financial crisis, firms possessed low levels of current and quick ratios. This indicates that firms' ability to pay back short-term debts is still weakening. Therefore, firms should pay more attention to their liquidity management during a financial crisis.

Table 7. The Effects of *AfterCrisis* on Current and Quick Ratios during the Financial Crisis

Dependent Variable \ Independent Variable	<i>Current_R</i>	<i>Quick_R</i>	<i>Current_R</i>	<i>Quick_R</i>
<i>Intercept</i>	5.0080*** (0.1752)	2.5342*** (0.1507)	3.2564*** (0.2498)	1.5374*** (0.2201)
<i>AfterCrisis</i>	-0.2571*** (0.0491)	-0.2369*** (0.0442)	-0.3808*** (0.0404)	-0.3858*** (0.0364)
<i>GROWTH</i>	-0.3950*** (0.1273)	-0.1050 (0.1185)	-0.7732*** (0.0954)	-0.5816*** (0.0871)
<i>STDROA</i>	1.0108***	2.0718***	0.8235***	1.3257***

Table 7. (cont'd)

Dependent Variable \ Independent Variable	<i>Current_R</i>	<i>Quick_R</i>	<i>Current_R</i>	<i>Quick_R</i>
	(0.2995)	(0.2801)	(0.2868)	(0.2632)
<i>CF</i>	0.2736* (0.1593)	-0.3958*** (0.1484)	1.5354*** (0.1827)	1.1987*** (0.1699)
<i>SIZE</i>	-0.0215* (0.0129)	0.0718*** (0.0113)	0.1134*** (0.0185)	0.1552*** (0.0164)
<i>LEV</i>	-4.2398*** (0.1269)	-3.7919*** (0.1159)	-2.9744*** (0.1634)	-2.3099*** (0.1477)
<i>FA</i>	-2.6643*** (0.1007)	-2.0553*** (0.0894)	-3.8545*** (0.1949)	-3.7364*** (0.1823)
<i>Firm dummies</i>			Included	Included
<i>Adjusted R²</i>	0.1422	0.1397	0.5369	0.5357
<i>F-value</i>	307.04***	300.79***	15.87***	15.80***

Notes: Newey–West heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

5. Conclusion

The effects of the 2008 financial crisis on the working capital management of U.S. enterprises have not previously been extensively investigated in the literature. Thus, our research takes U.S.-listed companies as the research sample over the period from 1990 to 2014, covering a total of 25 years, to investigate the effects of the 2008 financial crisis on their working capital management policy.

The results reveal that a financial crisis has no significant effect on CCC, implying it has no effect on the speed of working capital collection. However, firms have relatively low levels of current and quick ratios during and after the financial crisis period, denoting that their ability to pay back short-term debts is weakened. Therefore, firms should pay more attention to their liquidity management during a financial crisis, such as by retaining more cash and reducing unnecessary or non-urgent spending. In addition, authorities should issue advanced warning to those firms that may have liquidity problems during a financial crisis to prevent a domino effect that results in a global crisis. Additionally, for investors seeking to invest or those holding investments during a financial crisis, it is important to take firms' liquidity situation into account to avoid those that are likely to get into financial difficulties that could be triggered by a financial crisis. This study presents relevant insights into certain effects of the 2008 financial crisis on the working capital management of firms and provides empirical results that may be used by governments, enterprises, and investors as a source of reference.

Notes

1. See Wall Street Journal, November 2, 2009, "Jittery Companies Stash Cash," By Tom McGinty / Cari Tuna.

References

- Acharya, V. V., H. Mehran, and A. V. Thakor, (2010), "Caught between Scylla and Charybdis? Regulating Bank Leverage When There Is Rent Seeking and Risk Shifting," Working paper.
- Al-Rahahleh, A. S., (2016), "Corporate Governance Quality and Cash Conversion Cycle: Evidence from Jordan," *International Business Research*, 9, 140-150.
- Ang, J. and A. Smedema, (2011), "Financial Flexibility: Do Firms Prepare for Recession," *Journal of Corporate Finance*, 17, 774-787.
- Banos-Caballero, S., P. J. Garcia-Teruel, and P. Martinez-Solano, (2010), "Working Capital Management in SMEs," *Accounting and Finance*, 50, 511-527.
- Campello, M., E. Giambona, J. R. Graham, and C. R. Harvey, (2011), "Liquidity Management and Corporate Investment during a Financial Crisis," *The Review of Financial Studies*, 24, 1944-1979.
- Campello, M., J. R. Graham, and G. R. Harvey, (2010), "The Real Effects of Financial Constraints: Evidence from a Financial Crisis," *Journal of Financial Economics*, 97, 470-487.
- Chang, C. C., (2018), "Cash Conversion Cycle and Corporate Performance: Global Evidence," *International Review of Economics and Finance*, 56, 568-581.
- Chiou, J. R., L. Cheng, and H. W. Wu, (2006), "The Determinants of Working Capital Management," *Journal of American Academy of Business*, 10, 149-155.
- Core, J. E., W. R. Guay, and T. Rusticus, (2006), "Does Weak Governance Cause Weak Stock Returns? An Examination of Firm Operating Performance and Investors' Expectations," *Journal of Finance*, 61, 655-687.
- Deloof, M., (2003), "Does Working Capital Management Affect Profitability of Belgian Firm?," *Journal of Business, Finance and Accounting*, 30, 573-587.
- Duchin, R., O. Ozbas, and B. A. Sensoy, (2010), "Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis," *Journal of Financial Economics*, 97, 418-435.
- Garcia-Teruel, P. J. and P. Martinez-Solano, (2007), "Effects of Working Capital

- Management on SME Profitability,” *International Journal of Managerial Finance*, 3, 164-177.
- Haron, R. and N. M. Nomran, (2016), “Determinants of Working Capital Management before, during, and after the Global Financial Crisis of 2008: Evidence from Malaysia,” *The Journal of Developing Areas*, 50, 461-468.
- Hart, O. and L. Zingales, (2009), “A New Capital Regulation for Large Financial Institutions,” Working paper.
- Hill, M. D., G. W. Kelly, and M. J. Highfield, (2010), “Net Operating Working Capital Behavior: A First Look,” *Financial Management*, 783-805.
- Ivashina, V. and D. Scharfstein, (2010), “Bank Lending during the Financial Crisis of 2008,” *Journal of Financial Economics*, 97, 319-338.
- Jose, M. L., C. Lancaster, and J. L. Stevens, (1996), “Corporate Return and Cash Conversion Cycle,” *Journal of Economics and Finance*, 20, 33-46.
- Kashyap, A. K., R. G. Rajan, and J. C. Stein, (2009), “Rethinking Capital Regulation,” Working paper.
- Lazaridis, I. and D. Tryfonidis, (2006), “Relationship between Working Capital Management and Profitability of Listed Companies in the Athens Stock Exchange,” *Journal of Financial Management and Analysis*, 19, 26-35.
- Ng, C. K., J. K. Smith, and R. L. Smith, (1999), “Evidence on the Determinants of Credit Terms Used in Interfirm Trade,” *Journal of Finance*, 54, 11-29.
- Nia, M. M. and E. Mansoori, (2016), “Relationship Between Financial Constraints, Economic Crises and Working Capital Management of Companies Listed on Tehran Stock Exchange,” *International Business Management*, 10, 3141-3145.
- Nwude, E. C., E. I. Agbo, and C. Ibe-Lamberts, (2018), “Effect of Cash Conversion Cycle on the Profitability of Public Listed Insurance Companies,” *International Journal of Economics and Financial Issues*, 8, 111-117.
- Oseifuah, E., (2018), “Global Financial Crisis, Working Capital Management and Profitability of Non-Financial Firms Listed on the Johannesburg Stock Exchange, South Africa,” *Academy of Entrepreneurship Journal*, 24, 1-12.
- Prowse, S., (1998), “Corporate Governance: Emerging Issues and Lessons from East

- Asia,” The World Bank Working paper, Washington, D. C.
- Radić, N., F. Fiordelisi, and C. Girardone, (2012), “Efficiency and Risk-Taking in Pre-Crisis Investment Banks,” *Journal of Financial Services Research*, 41, 81-101.
- Rajan, S. and L. Zingales, (1998), “Which Capitalism? Lessons from the East Asian Crisis,” *Journal of Applied Corporate Finance*, 11, 40-48.
- Raykov, E., (2017a), “Analysis of the Weighted Average Cost of Working Capital of Selected Companies on the Bulgarian Stock Exchange during the Financial and Economic Crisis,” *Economic Alternatives*, 4, 555-572.
- Raykov, E., (2017b), “The Liquidity-Profitability Trade-Off in Bulgaria in Terms of the Changed Financial Management Functions during Crisis,” *Management: Journal of Contemporary Management Issues*, 22, 135-156.
- Reason, T., (2004), “Off the Shelf: The 2004 Working Capital Survey,” *CFO Magazine*.
- Shin, H. H. and L. Soenen, (1998), “Efficiency of Working Management and Corporate Profitability,” *Financial Practice and Education*, 8, 37-45.
- Shirasu, Y., (2012), “Corporate Bond Liquidity Spreads and Japanese Banks’ Risk Management: A Comparison of Two Financial Crises,” Working paper.
- Tong, H. and S. Wei, (2008), “Real Effects of the Subprime Mortgage Crisis: Is it a Demand or a Finance Shock?,” IMF Working Paper, International Monetary Fund and Columbia Business School, WP/08/186.
- Tsuruta, D., (2019), “Working Capital Management during the Global Financial Crisis: Evidence from Japan,” *Japan and the World Economy*, 49, 206-219.
- Wooldridge, J. M., (2015), *Introductory Econometrics: A Modern Approach*, Nelson Education.
- Wang, Y. J., (2002), “Liquidity Management, Operating Performance, and Corporate Value: Evidence from Japan and Taiwan,” *Journal of Multinational Financial Management*, 12, 159-169.
- Wilner, B. S., 2000, “The Exploitation of Relationships in Financial Distress: The Case of Trade Credit,” *Journal of Finance*, 55, 53-78.

Zakari1, M. and S. Saidu, (2016), “The Impact of Cash Conversion Cycle on Firm Profitability: Evidence from Nigerian Listed Telecommunication Companies,” *Journal of Finance and Accounting*, 4, 342-350.

Zeidan, R. and O. M. Shapir, (2017), “Cash Conversion Cycle and Value-Enhancing Operations: Theory and Evidence for a Free Lunch,” *Journal of Corporate Finance*, 45, 203-219.