



Cash flow management and manufacturing firm financial performance: A longitudinal perspective



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ARTICLE INFO

Article history:

Received 7 August 2013

Accepted 8 November 2013

Available online 18 November 2013

Keywords:

Cash flow

Supply chain management

Operations management

Manufacturing

Panel analysis

ABSTRACT

A firm's cash flow policies, which manage working capital in the form of cash receivables from customers, inventory holdings, and cash payments to suppliers, are inexorably linked to the firm's operations. Building on earlier research, this study: (i) extends prior studies by examining the relationships between changes in cash flow measures and changes in firm financial performance using a longitudinal sample of firm data; and (ii) investigates the direction of the relationship between quarterly changes in cash flow positions and firm financial performance. This study is conducted using the Generalized Estimating Equations (GEE) methodology to analyze a longitudinal sample of eight quarters of cash flow and financial performance data from 1233 manufacturing firms. The analyses find that changes in the widely used Cash Conversion Cycle (CCC) metric do not relate to changes in firm performance; however, changes in the less used Operating Cash Cycle (OCC) metric are found to be significantly associated with changes in Tobin's q . This examination of how changes in specific cash flow measures relate to changes in Tobin's q shows that both reductions in Accounts Receivables (measured as Days of Sales Outstanding [DSO]) and reductions in Inventory (measured as Days of Inventory Outstanding [DIO]) relate to firm financial performance improvements that persist for several quarters. Endogeneity tests of whether a firm's cash flow management strategy leads to changes in firm performance or if the cash flow strategy is a byproduct of firm performance suggest that reductions in DSO lead to improved firm financial performance.

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1. Introduction

Cash flow management has become a critical element of many firms' operational strategies (Fisher, 1998; Quinn, 2011). A firm's cash flow policies, which manage working capital in the form of cash receivables from customers, inventory holdings, and cash payments to suppliers, are widely linked to improved firm financial performance (Richards and Laughlin, 1980; Stewart, 1995). While industry has broadly accepted effective cash flow management as a performance improvement mechanism, the preponderance of academic investigations into the link between cash flows and performance examines the issue from a static, benchmarking perspective (Ebben and Johnson, 2011; Farris and Hutchison, 2002, 2003; Moss and Stine, 1993). Namely, although previous efforts propose that adjustments to a firm's cash flow will change the firm's performance, they support these propositions empirically by comparing and contrasting firms utilizing static

snapshot measures of cash flow positions and performance. Though this static approach has provided a wealth of insight into the value of effective cash flow management, economic relationships tend to be dynamic (Nerlove, 2005). In general, approaches that explore such relationships from a longitudinal panel perspective lead to more accurate inferences and a better understanding of the underlying economic complexities (Hsiao, 2007). Consequently, in this study, the relationships between changes in a firm's cash flow positions and changes in the firm's performance are explored from a dynamic viewpoint.

Prevalent working capital management theory advocates that firms can improve liquidity, and hence their competitive positioning by manipulating their cash flows (Brewer and Speh, 2000; Farris and Hutchison, 2002, 2003; Christopher and Ryals, 1999; Moss and Stine, 1993; Stewart, 1995). Further, a firm's ability to convert materials into cash from sales is a reflection of the firm's ability to generate returns effectively from its investments (Gunasekaran et al., 2004). Three factors directly influence a firm's access to cash: (i) cash from accounts receivables is not available to firms while they are awaiting customer payments for delivered goods; (ii) cash invested in goods is tied up and not available while those goods are held in inventory; and (iii) cash may be made available to a firm if it chooses to delay

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payment to suppliers for goods or services rendered (Richards and Laughlin, 1980). Although a firm's cash payments and receipts typically are managed by the firm's finance department, the three factors that influence cash flows are manipulated chiefly by operational decisions (Özbayrak and Akgün, 2006).

Although the literature contains numerous studies that examine the relationship among cash cycles, firm liquidity, and firm financial performance, this study explores several extensions of these previous efforts. First, because prior studies generally examine the relationship between snapshots of cash flow and performance measures from a static benchmarking perspective, this study explores the relationship between longitudinal changes in cash flow metrics and changes in firm financial performance over time. This approach will allow firms to determine which cash flow measures should be monitored and manipulated to track and improve firm performance. Second, because previous empirical cash flow studies typically use datasets from a single time period (and those few studies that utilize multi-period data do not utilize methodologies that adjust for the longitudinal nature of the samples), this study conducts an empirical analysis using a longitudinal data panel analysis methodology. This approach also facilitates the examination of possible time-lags in the relationship between changes in cash flow and firm financial performance. Finally, there is a question of endogeneity regarding whether a firm's cash flow management strategy impacts the firm's performance or whether the cash flow positions are a byproduct of a firm's performance (Deloof, 2003). This issue is examined by conducting Granger causality tests to shed light on the possible direction of the relationship between cash flow management actions and changes in performance.

This analysis focuses on manufacturing firms that are publicly traded on the U.S. stock exchanges. This focus was chosen because manufacturers' positions in the middle of integrated supply chains allow them to influence or be influenced by both suppliers and customers (Swaminathan et al., 1998). These interactions with both suppliers and customers also provide substantial opportunities for payment term flexibility between the parties. Additionally, compared to downstream supply chain partners, manufacturers typically have more inventory flexibility in that they can choose whether to hold inventory as raw materials, work in process, or finished goods (Capkun et al., 2009).

The next section discusses prior literature and develops the theoretical framework. The third section discusses the data sample and the study methodology and the fourth section presents the results. The final two sections discuss the implications of the findings, the limitations of the study, and possible research extensions.

2. Theoretical framework and hypothesis development

2.1. Measures and metrics

A firm's cash flow can be manipulated in three ways: (i) the time from when goods are sold until the revenue is collected by the firm may change; (ii) the firm's inventory levels may change; and (iii) the time that a firm takes to pay its vendors may change. When assessing or manipulating a firm's cash positions, one can monitor either individual measures of each of these three cash flow levers or metrics that are combinations of these three measures. The three measures and two composite metrics defined below represent the measures and metrics that commonly have been utilized in previous cash flow studies:

Days of Sales Outstanding (DSO): This measure represents the average time from when a sale occurs until the revenue is collected. It is calculated as the end of period accounts receivable divided by the sales, multiplied by the number of days in a period.

Days of Inventory Outstanding (DIO): This measure captures the average time that goods are held in inventory before they are sold. It is calculated as the end of period value of inventory divided by the cost of goods sold, multiplied by the number of days in a period.

Days of Payables Outstanding (DPO): This measure expresses the average time that a firm takes before paying its creditors. It is calculated as the end of period accounts payable divided by the quarterly purchases, multiplied by the number of days in a period.

Cash Conversion Cycle (CCC): The CCC metric (also called the Cash-to-Cash Cycle) combines the three cash flow metrics to provide an overall indicator of a firm's cash position. It is calculated as the sum of Days of Sales Outstanding and Days of Inventory Outstanding, minus the Days of Payables Outstanding. The CCC represents the time period required to convert cash investments in supplies into cash receipts from customers for goods or services rendered.

Operating Cash Cycle (OCC): The OCC metric uses only a subset of the CCC metric. It is calculated as the sum of Days of Sales Outstanding and Days of Inventory Outstanding. OCC differs from CCC in that it includes only inventory and sales outstanding. It does not consider payables, and therefore equates to the number of days that cash is held as inventory before payment is received from the customer.

Additionally, Table 1 details the calculations for each of the measures and metrics.

2.2. Prior cash flow management research

2.2.1. Theoretical commonalities

Table 2 summarizes the methods and findings of 12 relevant prior empirical studies that examine the relationship between cash flow and performance from an operations or supply chain management perspective. Although numerous additional academic studies have examined cash flow in many operational contexts, these 12 studies were selected specifically because they attempt to link firm performance with cash flow.

These studies employ a variety of methods to examine different aspects of the cash flow management questions; however, they all share a common theoretical groundwork: the studies assert that effective cash flow management improves a firm's liquidity, which previously has been linked to improved firm financial performance (Gitman et al., 1979). The performance improvements related to increased liquidity result primarily from an improved cash position, better credit, a reduced risk of bankruptcy, and/or the ability to self-finance new business initiatives (Churchill and Mullins, 2001; Moss and Stine, 1993; Richards and Laughlin, 1980; Stancill, 1987). Further, these studies consistently predict that actions that shorten the cash cycle and improve liquidity (i.e., shortening the receivable cycles, shortening inventory holding periods, and extending payment cycles) will improve firm financial performance.

Eleven of the twelve previous investigations detailed in Table 2 examine firms' cash positions using the Cash Conversion Cycle (CCC) metric. Nine of the studies explore these individual measures that comprise the CCC as well as the composite CCC metric itself; however, Moss and Stine (1993) and Ebben and Johnson (2011) examine only the CCC metric. In the study that does not focus on CCC, Churchill and Mullins (2001) examine the Operating Cash Cycle (OCC) metric. The metrics and their component measures are calculated with relative consistency across these papers. The specific relationships between the cash flow measures and metrics and firm performance are discussed below:

2.2.1.1. Days of Sales Outstanding (DSO) and firm performance.

A firm's ability to receive payments from customers for delivered goods or services rendered in a timely manner can improve the firm's liquidity (Gallinger, 1997). The cash received from a firm's

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