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State of the Art of Short-Run Financial Management

James A. Gentry

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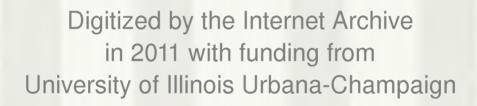
College of Commerce and Business Administration

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State of the Art of Short-Run Financial Management

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### State of the Art of Short-Run Financial Management

#### ABSTRACT

In 1973 Keith Smith presented the state of the art of working capital management. Since that date there has been a natural evolution and development of the topics related to short-run financial management (SRFM). The primary objective of this article is to update the state of the art of SRFM. A three dimensional problem space highlights the basic concepts used in SRFM research and model building since the early 1970s. A review of the literature shows that SRFM models have expanded from incorporating relatively simple relationships to the current state that integrates cash flows from SRFM components into a total valuation model of the firm. The literature review also encompasses the evolution of cash management, liquidity and numerous related research topics. The final section uses the literature review as a foundation for hypothesizing various paths that future SRFM research may follow.

In 1973 Smith [170] presented the state of the art of working capital management (WCM). He traced the development of research in working capital management, thereby providing an anchor for measuring future research productivity. Since the early 1970s the development of substantive WCM research has expanded dramatically, therefore, it seems appropriate to update the state of the art of short-run financial management (SRFM). SRFM reflects a broad, dynamic perspective in contrast to WCM, which connotes a static view with a balance sheet orientation. Therefore, in this paper SRFM is used to encompass all of the components that affect the inflow and/or outflow of cash through a firm. The objectives of this paper are to interpret the major directions of SRFM research in recent years and present a critical review of the SRFM literature; and finally, to hypothesize various paths that future SRFM research might follow.

Before evaluating recent contributions to the SRFM literature it is useful to identify major SRFM research themes. Exhibit 1 presents a three dimensional framework developed by Howard [88] that characterizes decision problems by their underlying structure. The three dimensions of the problem space are degrees of uncertainty, time dependence, and complexity. The degree of uncertainty ranges from deterministic situations where all variables are known, to highly

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probabilistic situations where little information is available about any variable. The time dimension ranges from a static condition of no change at a specific moment, to a dynamic condition that reflects changes occurring in future time periods. The complexity dimension is measured in terms of the number of variables required, where the more variables involved in the analysis, the greater the complexity [38, p. 212].

Each corner of the problem space corresponds to specific types of financial information or models. Corner 1 depicts information for a single variable that is deterministic and static. Financial ratios would be an example of Corner 1 information. Moving up the plane to Corner 4, the number of variables is increased, but the deterministic and static constraints are still present. From a financial perspective Corner 4 corresponds to balance sheet or income statement information.

Corner 2 reflects a deterministic, single variable problem with a changing (dynamic) orientation. Examples of Corner 2 information would be the calculation of future value or present value of an investment. The dividend valuation model is another example of a Corner 2 model. Corner 7 represents several variables that are changing over time. SRFM examples would be a forecast of monthly cash budgets, monthly proforma balance sheets and income statements. Also located at Corner 7 are linear programming models and the net present value (NPV) model, i.e., the discounted cash flow model (DCF).

Corner 3 represents a probabilistic, static, single variable set of information such as the frequency distribution of a financial ratio, funds flow component or any financial variable. Corner 6 is a

probabilistic, static, multivariable problem that resembles Markowitz's portfolio selection model [127]. Exhibit 1 shows that Markowitz added a new plane of thought to financial theory that encompasses the area bounded by Corners 1, 3, 4 and 6. Leading financial theory models such as the Sharpe-Lintner capital asset pricing model (CAPM), and arbitrage pricing theory (APT) are located at Corner 6.

Uncertainty and dynamic dimensions for a single variable are introduced in Corner 5. Option pricing theory (OPT) is a classic example of a Corner 5 model. Also using past daily cash flow information in an ARIMA model to predict a firm's cash flow position exemplifies a Corner 5 analysis. Corner 8 is the most complex corner location. It describes problems involving uncertainty, dynamism, and complexity. All decision problems could be at Corner 8, because all three factors are indispensable for a meaningful analysis [38, p. 214]. There are five classes of models that incorporate all three dimensions. They are control theory, dynamic programming, intertemporal CAPM, simulation and simultaneous equations. They are used to incorporate probabilistic information into a SRFM forecast that results in monthly cash budget and financial statements. The problem space provides an insightful structure to identify the type of contribution that can be associated with various classes of SRFM research publications.

#### A CRITICAL REVIEW OF SRFM LITERATURE

Because there has been several substantive research developments during the past 15 years, a critical review of the major research themes sets the stage for projecting future directions in SRFM.

## From Simple to Complex Models

Prior to the early 1970s, SRFM was identified with the management of individual current assets or current liabilities. Early research used accounting information to model or focus on specific activities such as cash management, accounts receivable management, inventory management, short-term borrowing and cash budgeting. Exhibit 2 identifies these early models as being located at Corners 2, 3 and 5 of the problem space.

As the knowledge base grew, more complex models were developed that linked together two or more SRFM components. Stone identified the natural integration of cash and credit management [183], and the design of a firm's banking system [184, 187]. Schiff and Lieber [162] and Shapiro [166] developed interrelationships that exist between receivables and inventories, while Bierman, Chopra and Thomas [15] focused on the linkage between optimal working capital and capital structure. The building of these more advanced models, that are located at Corners 6 or 7 in Exhibit 2, highlights one phase of an evolution that has occurred in SRFM research during the past 15 years.

The early research in SRFM created generally unrelated pockets of knowledge and it was conceptually based on balance sheet information. Early research efforts did not create a theory that integrated the cash flow contributions of the SRFM variables into the total value of the firm.

## An Integrated Theory of Value

Until the early 1980s SRFM research activities remained outside the mainstream of a rapidly developing risk-return oriented theory of

corporate finance. During the 1970s finance research emphasized the development of the CAPM, APT and OPT. These major theories were based on the widespread belief that financial markets are economically efficient. These theories assume the internal operations of the firm are efficient and, therefore, neither create or destroy value. Additionally, the long-run theories did not recognize the uncertainties created in a firm's day-to-day operations that directly affect the creation or destruction of value. The CAPM, APT and OPT assume there are a few relatively stable variables that determine the financial value of the firm in the marketplace. In contrast, the practice of SRFM is based on a large number of real variables that are changing almost continuously. Real value is based on the success of short-run resource management.

The need for integrating working capital information into a larger system was suggested by several authors throughout the 1960s and 1970s. 6

However, it was not until the early 1980s that Morris [134] recognized the need to incorporate cash inflows and outflows into a single period CAPM valuation framework. He incorporated operating cash flows into a modified CAPM which highlights the risk and return tradeoff as it relates to cash. The model is built on the idea that cash outflows must be financed either from existing cash balances or with costly borrowing. A cash flow shortfall will cause a firm to borrow and thereby increase the systematic risk of the dividend payoff to stockholders at the end of the operating horizon [134, p. 534]. When operating cash inflows are greater than the outflows, the firm uses the excess cash to repay the short-term debt and, if cash is available,

to fund the ongoing operations of the firm or invest in marketable securities. This framework recognizes that managing cash flows is a primary activity of the firm and, furthermore, it indicates that critical resources are invested in cash and/or receivables as well as in productive capital assets and inventories. Although Morris has rightly focused on cash balance management within the CAPM's one period time horizon, this approach does not embody the dynamic environment that is found in the short-run financial management process. Also the Morris modified CAPM approach does not develop the interrelationships that exist among major cash inflow and outflow experiences, such as sales/collection, purchasing/payment and production/inventory management efficiency. Despite these cash management shortcomings of the modified CAPM, Morris has made a significant contribution to the SRFM literature by integrating operating cash flow activities into the

In 1983 Sartoris and Hill (S&H) [160] made a major contribution by integrating short-run cash inflows and outflows into the net present value model (NPV). A significant contribution of this Corner 7 type model was to show that changes in short-run financial management policies have a direct effect on the value of the firm. The S&H model made a significant contribution to the corporate finance literature because it established a cash flow based theoretical linkage between short- and long-run financial management.

Gentry and Lee (G&L) [70] expanded the S&H model to incorporate real variables that have a significant effect on cash inflows and outflows and, therefore, on the value of the firm. The model provides an

overview of the numerous cash inflow and outflow components and shows how each one can create or destroy value in an NPV framework. The expanded model takes into account the interrelationships that exist among the sales/collection, purchase/disbursement, and production/inventory management efficiency effects. Additionally it incorporates forecasting error effects that cause changes in inventories, cash flow shortfall (borrowing) and excess cash flow (lending). S&H and G&L focused on the effects that real variables have on a firm's cash inflows and outflows, but their NPV models do not explicitly include a financial market risk measure that exists in the Morris modified CAPM model.

SRFM involves the management of real cash flows, assets and liabilities and includes many variables that cause a firm's daily flow of cash to change continuously. These characteristics of SRFM are best represented at either Corners 7 or 8 of the Problem Space. The CAPM, APT and OPT do not focus on the management of real cash flows, assets, and liabilities and unless modified the CAPM and APT do not possess the dynamic features that are needed to integrate the flows related to SRFM into a total financial planning model.

After a long period of incubation, the current literature has linked the cash flow contributions generated by SRFM decisions, policies and actions into the discounted cash flow (DCF) model and the CAPM, and these models are used to determine the theoretical value of a firm. Additionally, simulation, simultaneous equation and control theory models will set the stage for building new theoretical linkages between short- and long-run financial management which should result in a natural evolution of SRFM thought.

## The Cash Story

The concern over managing cash blossomed in the 1970s for several reasons [74]. There was a rapid increase in inflation and interest rates that focused management attention on the need to invest idle cash balances. Simultaneously computer technology emerged that provided commercial banks the tools to offer cash management services to corporate customers. Micro computers arrived in the 1980s and provided easy access to daily cash receipt and disbursement information that resulted in a better understanding of the short-run cash flow process.

Since 1970 the cash management (CM) literature has experienced phenomenonal growth that has been enhanced by the successful introduction of the Journal of Cash Management. In 1986 Srinivasan and Kim [173] presented the state of the art in cash management. They categorized the major cash management tasks that had evolved during the preceding fifteen years into five major conceptual areas: (1) cash balance management, (2) cash forecasting, (3) cash gathering, mobilization and concentration, (4) cash disbursement, and (5) designing of bank systems for credit services.

Several studies have analyzed the problem of designing an optimal banking system for credit and noncredit services. 11 A principal concern was determining how much in balances or cash to reimburse a bank for services it provided. When designing a company's banking system, Stone [187, p. 374] stressed the importance of taking into account the interrelationships that exist among a company's cash budget, credit requirement needs and the bank system design.

The cash flow timeline [51] was based on the principle of present value and it showed that a firm's value is determined by the amount and the timing of its cash inflows and outflows. In another context cash flow information in the form of funds flow components were used in a probit or logit model to classify and predict financial failure. Three separate studies by Casey and Bartczak [27, 28], Gentry, Newbold and Whitford [64] and Gombola, Haskins, Ketz, and Williams [77] found net operating cash flows, a more narrow definition of cash flows, are not significant in predicting corporate bankruptcy.

Another important dimension related to cash management is the investment of excess cash or borrowing short-term to cover a cash flow shortfall. There are numerous new products available for short run investment such as auction rate preferreds or Eurodollar certificates of deposits, plus other instruments discussed in [179, 180, 181]. Another interesting investment opportunity is the hedged dividend capture strategies developed by Brown and Lummer [23, 24], Zivney and Alderson [204] and Joehnk, Bowlin and Petty [93]. Miller [132] has developed a systems view of short-term investment management. He emphasizes the need to integrate short-term investment management and cash management support systems with the cash balance, bank compensation, payment scheduling and portfolio composition. The objective of the integration is to reflect the interdependence that exists among the investment and cash management activities.

Contemporary SRFM has evolved from a narrow balance sheet based working capital focus to a dynamic orientation with a comprehensive set of variables. The cash management literature has shown that SRFM

is a more comprehensive concept than working capital. The modern interpretation is that SRFM contributes to the value of a firm through the flow of cash from all of its operating, financial and discretionary components [82, 177].

## Liquidity

The concept of liquidity is closely associated with SRFM. For example, Smith [170] places special emphasis on the inverse relationship between liquidity and profitability. Gilmer [72] used the capital asset pricing model to show there is an optimal liquidity level for companies in selected industries. Myers [135] and Myers and Majluf [136, 137] indicate that financial slack is a critical ingredient in corporate finance, but, they recognize it is a complex phenomenon that is not well understood and needs further research. Brealey and Myers [21, p. 790] indicate we cannot successfully tackle the problem of working capital management until we have a theory of liquidity. Additionally Brealey and Myers suggest the broad question related to liquidity is how should a firm divide its total investment between relatively liquid and relatively illiquid assets. Lendors are concerned with the liquid nature of inventory and receivables in the event that net cash flow is insufficient to repay a loan. Likewise, financial failure is often associated with the lack of liquidity. These examples show that measuring liquidity and interpreting its effects on the value of the firm is a primary concern of SRFM. A brief overview of the development of the many faces of liquidity follows.

The characteristics of cash inflows and outflows, such as the level and speed of cash flow as well as its stability and patterns, are important components that should be included when designing a direct measure of liquidity. The finance literature frequently relates liquidity to a firm's net cash flow patterns. A leading method that directly measures liquidity with cash flow information was developed by Emery and Cogger (EC) [48]. They identified two approaches to measure liquidity and both utilize several variables and the dimension of uncertainty. The EC liquidity index is located at Corner 6 in Exhibit 2. One of EC's measures used a theoretical probability distribution function developed by Cox and Miller [35] to calculate the likelihood of insolvency occurring within a specified period of time. The second method measured the relative liquidity of a firm and it was based on a statistic derived from the likelihood of insolvency measure.

Disaggregating daily cash inflows and outflows and analyzing the stability of each time series provides one component in building a liquidity measure. The qualitative characteristics of a firm's assets, liabilities and cash flows supply a second component of a liquidity measure. Combining the qualitative and quantitative components would provide the information needed to create a comprehensive financial slack index (CFSI). Exhibit 2 shows the CFSI incorporates all three dimensions of the problem space and is located at Corner 8.

Financial statement information is widely used by external analysis to create an indirect measure of liquidity. A primary example of an indirect measure of liquidity is the cash conversion cycle (CCC)

developed by Richards and Laughlin [156]. The CCC is an additive measure based on the length of time that cash is tied up in the production, distribution and collection processes less the time associated with the deferral of payment to suppliers. The shorter the CCC the more liquid the firm. A value weighted cash conversion cycle (VWCCC) [71] uses cash flow information from the financial statement to enhance the interpretation of Richards and Laughlin's CCC. The VWCCC depicts liquidity as a two part multiplicative process. The first part is the length of time funds are tied up in each component of the operating cycle. The second is the amount of cash committed to each phase of production, distribution and collection less the payment to suppliers. As measures of liquidity the CCC and the VWCCC are less comprehensive and lack the dynamic qualities of EC's relative liquidity index or the suggested comprehensive financial slack index. CCC and VWCCC are located at Corner 4 of Exhibit 2.

The traditional liquidity measures, such as current or quick ratios, are one dimension indicators and are located in the vicinity of Corner 1 in Exhibit 2. On the other hand, a time series of monthly cash based funds flow components combines several variables changing over time. The result is a comprehensive, Corner 7 information source that can be used to analyze liquidity trends. In conclusion, daily cash inflows and outflows combined with qualitative information are superior financial slack measures that embody Corner 8 characteristics, but these data are difficult for external analysts to acquire. Thus the external analysts are forced to use indirect measures of liquidity combined with qualitative information as measures of liquidity.

## Receivables, Inventories and Payables

The literature related to the management of receivables is extensive. The receivables literature is subdivided into seven categories:

(1) monitoring performance, (2) measuring stability of the payment patterns, (3) credit policy effects, (4) interrelationship among working capital accounts, (5) investing in accounts receivable, (6) trade credit theories and (7) financing accounts receivable.

Monitoring the performance of receivables is the area that has received the greatest attention by researchers. 14 Several authors have shown that DSO, days sales outstanding in account receivables, is driven by a sales effect and is, therefore, a biased measure. Stone [185] was most lucid in showing that a payment pattern effect was responsible for changes in receivables. Carpenter and Miller (CM) [26] developed an algorithm that measured the changes in receivables caused by sales and collection effects. Gentry and De La Garza (GD) [68, 69] refined the CM algorithm, added a joint effect and used the trend in sales and collection patterns to measure the receivable strategy employed by management. Gallinger and Ifflander (GI) [61] suggested using the difference between actual and budgeted receivables in a single time period as a technique to measure the factors that cause receivables to change.

Customer payment behavior is crucial in explaining changes in accounts receivable. The standard textbook example assumes collection patterns are stable in the preparation of a cash budget. Kallberg and Saunders (KS) [96] tested the stability of the payment behavior of a set of retail customers and found they tended to speed up their

payments in periods of economic recession. The rationale for this early payment behavior is that, when economic conditions worsen, customers pay early in order to preserve their financial credibility with the retailers. Although untested, discovering if the payment behavior of corporate industrial customers is stable during a recession will be a significant contribution to the credit literature. Finally, evaluating the impact of changes in credit policy on the level and flow of accounts receivable is a valuable research area in corporate finance. 15

Why do nonfinancial firms extend credit to their customers or how do they establish the terms of sale? <sup>16</sup> Emery [43] focused on several financial market imperfections to explain why firms extend trade credit and how they establish the terms of sale. He provided a pure financial explanation for the values of the credit terms offered to customers. He identified a pure operating flexibility motive and a pure financial intermediary motive. Emery showed that a trade credit lendor is familiar with the payment behavior of its customers and can economize on lending transaction costs when extending trade credit. Additionally the trade credit lendor has an advantage over financial intermediaries related to collection costs. Finally, Emery showed there are increasing opportunity costs to the firm for not extending trade credit and that there are financial market imperfections in the extension of trade credit. These factors establish the limits on credit policy and provide the rationale for extending trade. Based on the preceding assumptions, Emery derives an optimal level of accounts receivable for the firm. 17

Recently Mian and Smith [130] analyzed the implications of the choice of accounts receivable financing policy that ranged from internal management to subcontracted financing through a factor. They presented seven alternate trade credit administration policies that encompassed the following modes of financing receivables: financing through general corporate credit, establishing a captive finance subsidiary, financing through accounts receivable secured debt, using a credit reporting agency, a credit collection agency or a credit insurance company, or using a factoring agent. They found larger, more credit worthy firms established captives, while the smaller, riskier firms issue accounts receivable secured debt.

The literature related to inventories is voluminous. In general, the inventory literature is not found in finance related journals, but rather is located in three separate areas. Topics related to inventory valuation are in the accounting related journals. Inventory planning and control models are in the management science literature and the impact of inventories on the aggregate economy tends to be found in the economics literature. From a financial perspective Hall's concept of a stockless production strategy [80] not only stands in sharp contrast to the traditional view of an optimal level of inventory, but it has profound implications on cash flow performance. Stockless production reduces work in process inventory and space needed for production, plus eliminating problems related to quality, production bottlenecks, coordination, obsolescence, shrinkage and supplier unreliability [94]. The financial benefit of stockless production is an increase in profitability, and liquidity, and reduction in financial leverage. Likewise the growth

of global competition [87, 112] has changed the competitive environment and created a revolution in manufacturing operations. Johnson and Kaplan [94] point out that the revolution was led by new practices emphasizing total quality control, just-in-time inventory systems and computer integrated manufacturing systems. The result is a change in inventory systems that have a direct affect on financial performance. Johnson and Kaplan emphasize the challenge for today's environment is to develop new and more flexible approaches to the design of effective cost accounting, management control and performance measurement systems. The development of these systems highlights the contribution of SRFM to the total value of the firm. Because the role of inventories is undergoing a significant change and because it cuts across many disciplines, a synthesis of the state of the art of inventory management will be developed in a separate article.

The research literature related to accounts payable is sparse.

Gentry and De La Garza [69] have developed algorithms for monitoring payables and receivables. The model shows payables change because of purchasing, payment and joint effects. A value weighted cash conversion cycle (VWCCC) [71] introduces a payables effect that takes into account the relative financing contribution provided by payables in the cash conversion cycle. The payable effect causes the VWCCC to be longer than the original CCC. The larger the gap between VWCCC and the original CCC suggests an indirect measure of the firm's liquidity position is less than expected.

## Related Research

A review of the empirical literature indicates that decision makers gain substantive insights from results generated by using accounting and financial information in multivariate models [2, 56, 111]. It is widely accepted that financial information based models are useful in predicting corporate failure, bond ratings and classifying the credit riskiness of commercial bank loans.

In fourteen major studies that predicted corporate bankruptcy, slightly over one-fourth of the significant ratios were based on accounting information related to working capital components [66]. In a study using funds flow components to predict financial failures, the receivables component was one of three significant variables [66, 67]. In a similar study using funds flow components to predict the ratings of bonds that had been reclassified, two of the five significant components were SRFM variables [65]. The two components were inventories and other current liabilities. <sup>18</sup> Financial ratios related to SRFM were used in two major studies to classify loan risk [38, 126], but none were found to be significant. These empirical studies highlight the importance of information related to SRFM in classifying and predicting bankruptcy and bond ratings.

A study by Chen and Shimerda [29] and Pinches, et al. [146] used financial ratios in a principal components analysis to determine the major financial characteristics that existed in a set of companies. The studies found seven principal components emerged from a cross section of companies. They were return on investment, capital turnover, financial leverage, short-term liquidity, cash position, inventory and

receivables turnover. These studies show the overall importance of the SRFM variables in describing the financial characteristics of companies.

In explaining the differences between large and small companies, Walker and Petty [200] found dividend policy, relative liquidity and profitability emerged as the three most significant discriminators. In an earlier study by Stoll and Curley [182], the current ratio and the quick ratio were found to increase as the firm size became larger. These two studies provide support to the general belief that a shortage of working capital is a problem for small firms. Zeghal [203] found the smaller the firm size the greater the informational content in financial statements. Zeghal hypothesizes this relation is due to the availability of information that is a complement to or a substitute for accounting information furnished by financial statements of large firms.

Operating leverage is a topic that is closely aligned to SRFM.

Recent studies [25, 58, 124] have developed a theoretical linkage between market determined risk, beta, and the degree of operating and financial leverage. The major components of the degree of operating leverage are sales, a principal cash inflow component, and operating costs, a principal cash outflow component. Cash inflow and outflow performance are affected by SRFM policies and practices. Thus developing the theoretical linkage between operating leverage and systematic risk, and, furthermore, empirically showing the existence of a relationship, is a significant contribution to the SRFM literature. The essence of the finding is that SRFM policies and practices affect cash inflow and

outflow results which are highly correlated to the variance of market rates of return on a firm's common stock.

#### Future Directions

In this section the objectives are to evaluate briefly Smith's forecast of future directions in working capital management research; to review contemporary research trends and develop the implications for future SRFM research; to explore how new data bases will enhance the development of knowledge pertaining to SRFM; to introduce the role of artificial intelligence into SRFM; and to show that financial futures, options, and new securities, as well as behavioral studies, will play a vital role in the direction of future research in SRFM.

## Smith's Forecast

In 1973 Smith [170] presented a forecast that focused on future directions and developments in working capital management research. Smith envisioned a dynamic model that would incorporate the tradeoffs between liquidity and profitability, and that would reflect the interrelationships among the management of current assets and current liabilities. Smith advocated the development of a model that simulated various financial strategies and generated cash budgets, pro forma balance sheets and income statements. The simulated forecasts would show the borrowing (liquidity) requirements and the after tax income (profitability) results. Also the simulation would incorporate the basic interrelationships that existed among the several financial variables. Finally, he saw the availability of better data bases and the spirit of cooperation between academics and business executives as

a motivating force that would integrate short— and long—run issues into a common theoretical framework. It has taken more than a decade for Smith's early insights to materialize. Additionally, along the path to developing an integrated valuation model, there have been numerous other contributions and findings.

## Srinivasan and Kim

In their 1986 recommendations for future research directions in cash flow management, Srinivasan and Kim (S&K) [174] suggested a revised taxonomy of cash management decision making. S&K suggested that cash management decisions be grouped as operational and infrastructural. They advocated research should be directed toward developing control measures for both of these major groups of decisions. The operational decisions are related to cash forecasting, investing, borrowing, and cash position. Cash management is a dynamic process that depends on revised information as the future unfolds. Infrastructure decisions relate to building support systems for collecting deposits, controlling disbursements, determining target balances, transferring cash and establishing credit lines. These decisions are based on a forecast of future needs and are between the corporate user and the financial institution. S&K's view of future research directions are more narrowly focused on cash management in juxtaposition to the broader more philosophical views of Smith.

## Porter and Rappaport

Porter [152, 153] and Rappaport [155] have developed a solid structure that will motivate future research in the area of SRFM. Porter's

competitive analysis model provides a solid anchor for designing and evaluating strategic plans. In concert, Porter's value chain and Rappaport's discounted cash flow information system show how value is created in a company and, thereby, make it possible to determine if a chosen strategy will result in a company achieving a competitive advantage. The shareholder value approach shows that SRFM decisions related to operating inflows, operating outflows and working capital are major contributors to the value creation process. 19 During the next decade, research focused on understanding the linkage between SRFM decisions and shareholders value creation will provide new discoveries, insights and enlightenment.

## Valuation Models

Earlier we observed the cash flow components that contribute directly to the value of the firm have been integrated into the discounted cash flow model (DCF) and the CAPM. However, the CAPM is unable to capture the dynamics of the intertemporal changes that are pervasive among the SRFM cash flow components, and the DCF model does not provide a direct measure of the risk-return tradeoff that is present in the CAPM. Furthermore, neither model incorporates the simultaneous interaction effects that exist among the cash flow components, such as the interrelationship among collection and sales, payment and purchases, or inventory management efficiency and production. Ideally what is needed is a valuation model that incorporates the nonlinear dynamics of the cash flow components, accommodates the simultaneous interaction effects among these components and captures the risk/return tradeoff perspective.

In searching to develop the idealized valuation model there are several possible paths that future research may follow. Two approaches that offer promise are simultaneous equations [59] or control theory models [30]. Brealey and Myers [21, p. 789] are optimistic that the option pricing theory may provide fresh insight into the unraveling of this highly complex valuation process. Lam and Chen [106] provide contingent chain approach related to credit policy. Jackson, a physicist, [89] has developed a nonlinear dynamics approach that appears to have significant potential for integrating cash inflows and outflows from several sectors into a total valuation model. Cash inflows and outflows are frequently portrayed as being similar to liquid flowing through a series of pipelines that are connected to a common tank [123]. The literature on fluid dynamics [196] may provide another theoretical approach for building a complete valuation model. Finally, it may be that the SRFM process is too complex to be integrated realistically into a total valuation model. In that event the development of partial valuation models that focus on lowering cost or reducing risk may be more achievable.

#### Positive Research

In the future more attention will be devoted to developing positive theories of working capital management. Many descriptive contributions have resulted by examining trade credit or cash management behavior under economic conditions of imperfect markets. In analyzing the economic rationale of why firms extend trade credit, one approach to a positive theory is the idea that the firm selling a

product and extending credit has more information than the buyer of the product. This concept is referred to as the asymmetry of information and has provided unique insight in explaining the implications of trade credit behavior [172].

In suggesting a new framework for positive theories, Emery [47] suggested the need to change our focus on cash management research from explaining the size of cash balances to explaining the utilization of cash management services. Emery's approach would focus attention on the information used for decision making and the cost associated with collecting amounts receivable. Porter [152, 153] advocates analyzing the competitive position of the buyer and seller in evaluating the competitive position of a firm. Determining the bargaining power of the buyer and the seller provides a fruitful approach for explaining collection and payment behavior and the rationale for existing credit terms. <sup>21</sup>

An undeveloped area in financial management is the management and control of inventory. The accounting literature provides the best source of information for explaining the valuation of inventories. Equally important is understanding the efficiency involved in managing and controlling inventory. One of the most critical problems facing management is predicting and controlling inventory when there are errors in forecasting the demand for a product. In turn, these forecasting errors create uncertainty in purchasing and production, which results in inefficiencies in managing inventories.

Examining decision making under conditions of uncertainty in contrast to certainty may provide a framework for enhancing our understanding of collection and payment behavior. The positive theorist is interested in what causes risk and how firms try to control the risks that are present in a credit granting environment. Additionally credit is considered a marketing tool that directly affects the price of the product. Thus the exploration of creating, controlling or avoiding risk appears to be a productive approach to developing positive theories related to cash and credit management.

Kaplan [97] observes that cost systems are designed to value inventory for financial and tax statements. He believes these systems are not giving managers accurate and timely information needed to promote operating efficiencies and measure product cost. Developing positive theories that explain the financial implications of inventory would be a valuable contribution to the SRFM literature.

#### Financial Slack

What is the value of liquidity? According to Brealey and Myers [21, p. 790-791] determining the value of liquidity is one of the 10 unsolved problems in finance. They indicate liquidity is a matter of degree and the relevant strategic question for management is "How should it divide its total investment between relatively liquid assets?" We do not have a theory that explains how much cash a firm should hold or be able to acquire quickly without affecting its cost. In an anecdotal sense, we observe liquidity is most appreciated during a financial crisis and it is not as important when financial stress is relatively low.

Future research efforts will focus on creating a comprehensive financial slack index. A liquidity system measure should take into account the relative liquidity of each asset class, e.g., receivables, raw materials, finished goods, and the ability to access capital or money markets [14, 189]. Liquidity should be judged on a continuum and each asset or source of funds rank ordered according to its liquidity characteristics. The development of a comprehensive financial slack index should lead to the evolution of a theory that integrates the dimension of liquidity into the value of the firm.

## Technology and Information Effects

Computer technology has made a dramatic contribution to the practice of managing the inflows and outflows of cash and controlling inventories. Decision support systems provide information to management that results in unique operational insights related to the collection of cash and the management of receivables, the payment of cash and the control of payables and the control of production efficiencies and the management of inventories [84]. The availability of quality information and systems that store and retrieve data provides the foundation for improving the information generated for preparing the cash budget forecast. Also, hopefully, forecasting errors will be reduced.

During the last decade electronic technology has created a revolution in activities related to short-run financial management. There is little doubt that future growth and refinement of decision-support systems and the management of information will result in changes in

operating management achievements that are currently unimaginable. Corporate strategy will focus on using capital resources to improve the decision support systems and the management of information in order to gain a competitive advantage and improve operating performance [63]. These decision support systems and the management of information are the new centerpieces of short run financial management research. Firm value is created through the building of these systems and shortrun financial management research is directly connected to the evolution of the information age. New technology and data bases will be at the forefront of advances in short-run financial management research in the next decade. A natural interrelationship exists between SRFM and corporate strategic management that is based on the substantive contributions that operating cash flows make to firm value. In the future there should be significant growth in research that explores the connection among financial information systems, financial management activities related to operations, and strategic management of the firm.

## Daily Cash Flow Information and Empirical Research

Daily cash flow information is the cornerstone for building a deeper understanding of SRFM. Cash flow data files explicitly show the patterns of cash inflows, cash outflows and net cash flows, which is the information needed to analyze their stability over time.

Additionally, the cash flow data bases provide the foundation for determining the factors that cause changes in the cash flow components and for analyzing the intertemporal relationships among the inflow and

outflow components [75, 76]. Although, currently, these cash flow data bases are not easily accessed, they are the ultimate information source for developing theoretical relationships and testing hypotheses related to SRFM. Perhaps in the future there will be an institutionalized cash flow data base equivalent to CRSP or Compustat. The availability of cash flow data bases will stimulate new research efforts and provide fresh insights and new theoretical developments into SRFM.

In preparing cash budgets, and in monitoring receivables and payables, a major problem is predicting the timing of cash inflows and outflows. 23 The timing of cash inflows and outflows is closely related to the payment behavior of a firm's customers and the disbursement behavior to its suppliers. The corporate sector has access to superior software programs for managing and controlling receivables and payables. These programs make it possible for a firm to measure and evaluate the stability of the payment behavior of its customers and the stability of a firm's disbursement behavior to its suppliers. The profiles of payment and disbursement patterns are affected by competitive factors in the industry and firm, as well as seasonal and random effects. The study of payment and disbursement behavior should lead to improved techniques and models for predicting cash inflows and outflows. A natural outgrowth of this research should be a better understanding of the relationship between customer payment behavior and the value of the firm. Likewise, the relationship between a firm's disbursement behavior to its suppliers and value of its shares should result in a better understanding of the value creation process.

## Quarterly Information and Empirical Research

Porter and Rappaport provide an economic framework for evaluating the contribution of various SRFM cash flow effects to the value creation process. Quarterly financial statement information in Compustat II is ideal for analyzing relationships among key SRFM variables and discovering how they contribute to the value of a firm. Additionally Compustat II makes possible the study of intertemporal value chain-cash flow relationships among cash based funds flow components for firms in different competitive environments.

Although SRFM is closely related to cash flow information, accounting principles are the foundation for establishing the value of receivables, inventories and payables. The inventory valuation system determines the stock of inventory reported and the flow of production throughout a period. Likewise, the allocation of direct labor and indirect costs have a profound influence on inventory value. Because cost allocation systems and inventory valuation methods are undergoing radical change and they differ among industries and firms, understanding these systems will produce new insight concerning the speed and amount of cash that flows through a firm and how it creates value. Likewise the relationship between payables and raw materials is determined by accounting principles. The effects of this relationship and how it affects value is not well understood in SRFM. 24

Because managing receivables and payables is a massive task for larger companies, a few firms are experimenting with new procedures related to purchases and payments. Where the customer and supplier have a well established relationship, and the supplier has a record of

delivering quality goods, the customer places an order with the supplier and simultaneously encloses payment without receiving an invoice. The result of this action is a substantive reduction in operating costs. Additionally, a few large corporations have changed to an electronic disbursement system for paying their suppliers [84]. If these procedures are followed by large and mid-size companies, it will mean a dramatic change in cash receipt management in the next decade. These and other changes in SRFM institutionalized procedures can cause substantive changes in value. Future research will use Compustat II information to evaluate these changes in accounting procedures and will develop the affect of these changes on the creation of value.

In summary, there are several new developments underway that will lead to a better understanding of SRFM and its linkage to the value creation process. These new developments are:

- availability of detailed daily cash inflow and outflow information for several years;
- availability of direct and indirect labor cost information related to production and inventory;
- linking relationships among SRFM variables to the underlying accounting theory and principles;
- · changing accounting systems and their effect on cash flows;
- developing new electronic systems for paying suppliers and collecting from customers.

Research will expand the understanding of the linkage of SRFM decisions to the value of the firm. As these linkages develop, SRFM will be

naturally integrated into valuation models of the firm. The ultimate goal is the development of Corner 8 valuation models that incorporate key theoretical relationships among several long and short-run variables; and a model that allows variance in the performance of the variables throughout the planning horizon.

# Artificial Intelligence

Several SRFM activities are natural applications for artificial intelligence (AI) systems [167, 173, 174], e.g., credit analysis and management, credit scoring, cash management coupled with short-term lending and borrowing decisions, management and control of inventories, and production planning and control. The information used in the knowledge-based system is frequently acquired by the method of learning by being told. The system acquires its domain knowledge from experienced decision makers in the field, such as experienced credit or cash managers, and transforms the knowledge into the appropriate form.

Learning is an important feature of any intelligent system, therefore, more advanced AI systems are equipped with a learning capability. The learning dimension comes into play when the system (1) learns decision rules for the knowledge base, knowledge acquisition, and (2) refines existing rules by observing prior problem solving experience, knowledge refinement process. To achieve these learning functions poses an important design issue concerning the inductive inference technique for rule learning and knowledge acquisition.

The models developed for SRFM will employ production rules that represent basic knowledge of the system being created. The success of

the AI models for SRFM will rest on the ability to structure the decision process being created and to design appropriate production rules that correctly represent the system being created. The economic payoff for creating AI systems is quite high in areas related to credit and/or cash management and in production and/or inventory management. Within the next five years, the development of these AI systems will provide fresh insight and new perspectives related to SRFM.

# Financial Instruments and Other Topics

The need to shift risk via financial futures or options will experience substantial growth in the next decade. Emerging financial strategies create new financial contracts that shift a firm's risk exposure to the marketplace. The growth of the derivative securities market is closely related to SRFM and it provides a natural base for growth and development, e.g., financial futures and options [17, 18, 101, 105, 149, 168, 197], and swaps [169, 198]. Additionally investment banking firms are creating new financial instruments to meet specialized corporate needs and extending the rate of return effects on the short-run portfolio [107, 108]. These new instruments are providing new sources of cash and also opportunities to meet SRFM investment and borrowing needs. During the next decade, these new instruments will provide numerous directions for future SRFM research.

There are a variety of changes occurring in the business environment that will significantly affect future developments related to SRFM. The globalization of markets [1, 87, 94, 112] introduces new control and management systems that directly change the inflow and outflow of cash, the allocation of costs, and the level of inventories, receivables, and payables. The long-run impact of financial and organizational restructuring are not understood, but they will introduce significant changes in SRFM. The need to devise short-run performance measures that are consistent with a firm's strategies and its product and process technologies [94] will have a profound affect on the future directions of SRFM. The change to a statement of cash flows [49, 55] will introduce a new measurement system that will significantly enhance the contributions of SRFM to the value creation process.

### CONCLUDING REMARKS

SRFM is closely related to the operations management of a firm and it plays a key role in creating stockholder value. The theoretical linkage between cash flows generated from SRFM and strategic financial management decision making is well established. Because SRFM is associated with operations, it does not possess the romance of a financial restructuring or the deal making related to a takeover. Nevertheless, the creation of net cash flows through SRFM decision making is how long-run value is created for stockholders.

Future research will focus on the creation of valuation models that incorporate the nonlinear dynamics of the cash flow components, accommodate the simultaneous interaction effects among the components, and capture the risk return perspective. Liquidity is another area where future research will produce a comprehensive index that will measure financial slack. Furthermore, linking liquidity to valuation theory will be a substantive contribution to the SRFM literature.

Corporate decision support systems and management of financial information form a new research centerpiece for SRFM. New daily or weekly cash flow data files will serve to enhance our knowledge of the liquidity system. Artificial intelligence model building, information technology expansion, risk shifting through derivative securities, globalization of markets and devising short-run performance measures that are consistent with a firm's strategies, product and process technologies provide the foundation for the future direction of SRFM research.

Financial research has not focused on SRFM behavioral dimensions that cause the creation or destruction of shareholder value, e.g., cash flow forecasting errors, customer payment patterns, supplier disbursement patterns, or inventory cost patterns. Behavioral research related to SRFM may grow rapidly in the future and provide an entirely new set of issues.

### Footnotes

<sup>1</sup>Baumol [4] and Miller and Orr [131].

<sup>2</sup>Cyert, Davidson and Thompson [36], Cyert and Thompson [37], Benishay [8], Levy [113], Mehta [128, 129] and Greer [78].

<sup>3</sup>Beranek [10], Magee [118] and Snyder [176].

<sup>4</sup>Robichek, Teichroew and Jones [157].

5 Lerner [110].

6 In 1963 Beranek [9] created two classic Corner 8 type models for managing receivables and cash. Shortly thereafter Walker [199] developed a series of propositions that related the policies of WCM to the amount of risk that management was prepared to assume. In the mid 1970s Cohn and Pringle [31] suggested integrating working capital into the CAPM because working capital decisions are related to the asset returns which, in turn, are related to the market portfolio. Sartoris and Spruill [161] designed a goal programming model that uses different sets of priorities for the attainment of profitability and liquidity goals. Kim and Atkins [102] advocated a net present value approach for evaluating the expansion of accounts receivable. Knight [104] and Smith [171] suggested that WCM should be integrated into the mainstream theory of finance and not be treated as an isolated special case. In 1980 Gentry [62] used a simulation approach in a value maximization framework to integrate the cash flow contributions of WCM components into a capital budgeting model.

7 Cash balance management encompasses short term borrowing and investing, cash forecasting and cash position management [173]. Robichek, Teichroew and Jones [157] focused on short term borrowing while Orgler [141, 142] presented cash management as a multi-period linear programming model. The Orgler model was designed to minimize the net cost from a cash budget through the planning horizon. Several authors have used linear programming to formulate the cash management process, e.g., [73, 119, 122, 125]. Maier and Vander Weide [122] developed a leading user friendly L.P. model and Stone [183] created a financial statement simulator to determine a firm's line of credit and/or short term investments needs.

There are numerous statistical based cash forecasting models. A few of the leading models were created by Stone and Wood [193], Stone and Miller [191, 192], Miller and Stone [133], Boyd and Mabert [20], Beehler [5], Kallberg and Parkinson [95], and Homonoff and Mullins [85]. The cash gathering process collects customer payments and deposits them into the banking system. Lockbox collection models were created by several authors, e.g., Maier and Vander Weide [120], Stone [186], Levy [113], Corneujols, Fisher and Nemhauser [34], Nauss and Markland [138, 139] and Fielitz and White [53, 54].

<sup>9</sup>Cash mobilization and concentration focuses on moving funds through a concentration system to desired locations where the company can efficiently utilize its resources. The principal focus is on selecting concentration banks and transferring funds among banks. Stone and Hill [190] are responsible for introducing the concentration system concept and analyzing its affect on cash management.

 $^{
m 10}$  The objective of the cash disbursement process is to select optimal disbursement sites. Maier and Vander Weide (MV) [121, 122] developed a unified model that locates lockboxes and disbursement banks. Gitman, Forrester and Forrester [73] also developed a cash disbursement model. The MV model recognized that a firm way use one bank for both collecting customer payments and disbursing its checks. In surveying the research on the lockbox location problem, MV [121, p. 363] divide the literature into (1) formulation and economic analysis and (2) mathematical optimization techniques. MV [121] learned from experience that the existing academic literature does not recognize the importance of data in building lockbox and disbursement models nor the over simplicity of the mathematical formulations. Ferguson and Maier [50] used the efficient frontier concept from portfolio theory to show a firm can design a disbursement system that delays the availability of funds to its suppliers, but it faces the risk of the Federal Reserve closing the loopholes that caused the delayed payments.

11 For example, Stone [184, 187], Emery [44], and Pogue, Faucett and Bussard [150].

 $^{12}$ Gentry, Newbold and Whitford [64, 66, 67].

13 Lemke [109] created a liquidity flow index based on forecasted operating cash flow information from the cash budget. Lemke's liquidity flow index was a valuable contribution, but it does not include cash inflows or outflows from financing, investment or working capital components, or cash outflows to fixed coverage expenditures or dividends. Therefore it is an incomplete measure of liquidity.

14 For example, Freitas [57], Levy [113], Lewellen and Edmister [114] and Stone [185].

15 Greer [78] developed two normative, analytical models to determine the optimal number of credit applicants to accept. Halloran and Lanser [81] showed that credit policy adjustments in response to anticipated inflation does affect the value of the firm. Hill and Riener [83] used a discounted cash flow model to measure the cost/benefit tradeoffs related to a cash discount decision. Weston and Tuan [202] verified the optimizing methodology of Hill and Riener and found it produced the same results as a generalized approximation method. Mehta [128] derived operating decision rules for credit extension by examining past bad debt levels, credit period length, collection activities and lost sales levels. Srinivasan and Kim [175], with a comment by Eisenbeis [41], focus on a credit granting classification model.

<sup>16</sup>Bierman and Hausman (BH) [16] offer a set of credit granting models that quantify the expected value of future credit extension opportunities. BH capture an important dimension concerning why firms extend credit. Credit scoring models discriminate between good and bad credit risks, and generate weights for various characteristics of the credit applicant. The total weighted score is used to estimate creditworthiness which provides a foundation for establishing credit terms [154, 178]. Schwartz [163] concluded that a seller with easy access to capital markets may benefit by extending trade credit to customers who do not have easy access to capital. Lewellen, McConnell and Scott [116] showed that trade credit cannot be used to increase firm value when financial markets are perfect. Under these circumstances, all acceptable credit terms to sellers and buyers are the present value equivalent of cash terms. They did indicate imperfections in the financial markets may exist which would explain the presence of accounts receivable.

17 In another article, Emery [46] discusses the four incentives for trade credit. The incentives are financial, operating, contracting cost and pricing motives. The theories described provided explanations concerning why and when non-financial firms lend money to their customers. Emery [45] develops a positive theory of trade credit based on its use as a financial response to deterministic variations in demand. The operating alternatives to demand are modeled using results from the peak-load pricing literature [45].

 $^{18}$ SRFM ratios were included in all of the following studies designed to predict bond ratings [3, 6, 7, 86, 98, 144, 145, 147, 148, 151, 201].

The integrated valuation models of Sartoris and Hill, and Gentry and Lee are closely related to the efforts of Porter and Rappaport.

For example see Beranek [11], Bierman and Hausman [16], Dirick and Wakeman [39], Ferris [52], Greer [78], Smith [172], Schwartz [164] and Schwartz and Whitcomb [165].

<sup>21</sup>See Beranek [11] for a series of hypothesized relationships that serve as the basis of future research topics in the area of positive theory building.

 $^{22}\mathrm{Norgaard}$  [140] focused on building a positive theory that would have zero working capital in the firm.

For example see Bowen, Burgstahler and Daley [19], Emery [42], Ferguson and Hill [51], Lewellen and Edmister [114], Lewellen and Johnson [115], Stone [188].

Studying interrelationships among the leading working capital components offers unique promise toward building new theoretical

understanding of cash inflows and outflows. Only a few researchers have pursued this topic. Haley and Higgins [79] analyze the relationship between inventory policy (order time) and trade credit policy (order quantity and payment time). Schiff and Lieber [162] present an integrated dynamic model for receivables and inventory management. The model optimizes credit and inventory policy. Shapiro [166] discusses inventory purchase strategies and credit granting policies in soft currency countries. Kim and Atkins [102] were the first to use the net present value approach to determine if accounts receivable were an acceptable investment alternative for a firm. The Kim and Atkins NPV approach was a forerunner of the more expansive models that integrate SRFM variables into the value creation process of the firm.

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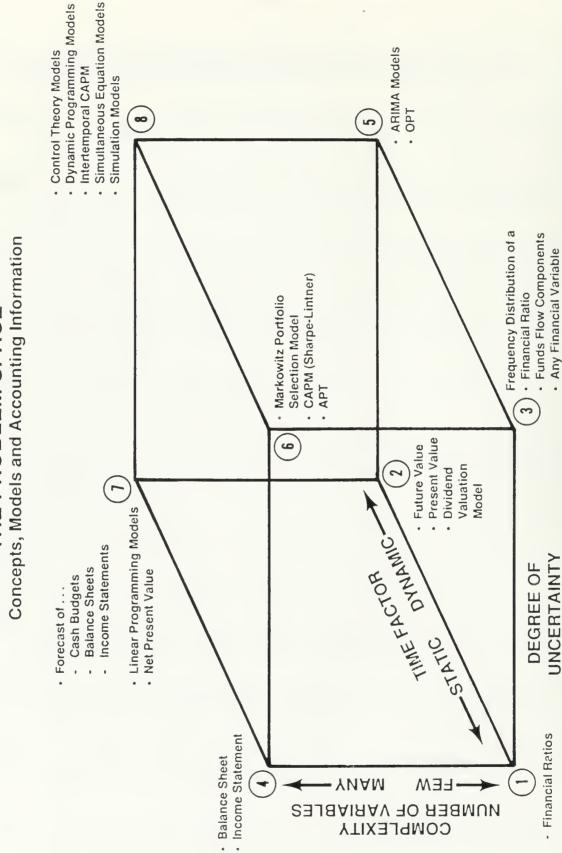
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# THE PROBLEM SPACE



PROBABILISTIC—

-DETERMINISTIC

# Decision Support Systems Comprehensive Financial Shaw and Gentry Srinivasan and Kim Slack Index Myers Miller Bierman, Chopra and Thomas Emery and Cogger **Authors and Concepts** Morris ິຕ **(9**) **PROBABILISTIC** Kallberg and Saunders DANAMIC Robichek, Teichrow Funds Flow Analysis Schiff and Leiber TIME FACTOR Sartoris and Hill Kim and A!kins and Jones UNCERTAINTY DEGREE OF Rappaport Beranek Shapiro Stone STATIC - DETERMINISTIC · wwccc 000 **LEW** NAM · Current Ratio Quick Ratio NUMBER OF VARIABLES COMPLEXITY

THE PROBLEM SPACE

FIGURE 2







