

# A Dynamic Model for Cash Flow at Risk

Luca Gentili

Dipartimento di Scienze Economiche - DSE, Università degli Studi di Verona  
luca.gentili@univr.it

Bruno Giacomello

Dipartimento di Scienze Economiche - DSE, Università degli Studi di Verona,  
and Polo Universitario di Studi sull'Impresa, Vicenza  
bruno.giacomello@univr.it

Dario Girardi

Dipartimento di Scienze Economiche - DSE, Università degli Studi di Verona  
dario.girardi@univr.it

Martino Grasselli

Dipartimento di Matematica, Università degli Studi di Padova and Léonard de  
Vinci Pôle Universitaire, Research Center, Finance Group, 92 916 Paris La  
Défense, France  
martino.grassell@unipd.it

## Extended Abstract <sup>1</sup>

*In this paper we define a new dynamic approach for measuring the Cash-Flow-at-Risk of a firm. Starting from the assumption that the balance sheet evolves according to a system of difference equations involving the most important accounting records, we define a new risk measure, tailored on our dynamic approach, which takes full advantage of its focus on the liquidity process. A numerical example based on a real case study shows the flexibility of our approach in describing cash flow dynamics and cash distress events. In order to reach this goal we proceed following three steps. First, we define a mathematical model for describing the evolution of the firm's balance sheet, by taking into account the relevant economic dynamics of the company, with special regard to the cash flows. In the second step, we define a new risk measure, based on the CFaR concept, which takes full advantage of our formalism for the balance sheet representation. Finally, in the third step we give a concrete application of our approach through a case study based on real data, in which we illustrate the potentials of this new quantitative tool in providing risk management information. We now describe each step of the procedure and review the related literature. Our CFaR methodology consists in performing a balance sheet quantitative analysis that allows us to select the exogenous variables having the greatest impact on company assets and liabilities. Then, using market data on large time series, we insert in our*

---

<sup>1</sup> Special session: [UT]

Corresponding author:[Bruno Giacomello, bruno.giacomello@univr.it].

Speaker:[Bruno Giacomello, bruno.giacomello@univr.it].

*dynamic model the evolution of such variables, so determining the probability distribution of a cash flow item at a given point in time, usually one, two or more years. Our approach attempts to overcome the shortcomings of the bottom-up methodology, as it does not deal only with pro-forma cash flow statements, and at the same time it tries to overcome the top-down approaches because it does not rely on pure statistical models, taking into account the relevant economic dynamics of all the balance sheet components. Finally, as a third step, we apply the new CFaR methodology that we have just presented to a real case study. We investigate the case of NTV Spa and we discuss the descriptive capability of our approach in terms of providing information on the risk position of the firm and generating realistic and unbiased cash flows.*

## **Keywords**

Cash flow; difference equation; sensitivity analysis; Cash Flow at Risk.

## **References**

- [1] Abu-Abbas, B. M. (2014). Direct, Indirect, or Both Methods of Reporting Operating Statement of Cash Flows. *International Journal of Finance and Accounting*, 3(6): 335–340.
- [2] Andren, N., Jankensgard, H., and Oxelheim, L. (2005). Exposure-based cash-flow-at risk: An alternative to VaR for industrial companies. *Journal of Applied Corporate Finance*, 417(3): 76–86.
- [3] Andren, N., Jankensgard, H., and Oxelheim, L. (2010). Exposure-Based Cash-Flow-at Risk for Value-Creating Risk Management under Macroeconomic Uncertainty. IFN Working Paper No. 843.
- [4] Austin, L. M. and Bradbury, M. E. (1995). The accuracy of cash flow estimation procedures. *Accounting and Finance*, 35:73-86.
- [5] Bahnson, P., Miller, P., and Budge, B. (1996). Nonarticulation in Cash Flow Statements and Implications for Education, Research and Practice . *Accounting Horizons*, 10:1–15.
- [6] Bjork, T. (1998). *Arbitrage theory in continuous time*. Oxford University Press, Oxford.
- [7] Brown, L., Huang, K., and Pinello, A. S. (2013). To beat or not to beat? The importance of analysts cash flow forecasts. *Review of Quantitative Finance and Accounting*, 41): 732–752.
- [8] Cheng, A. and Hollie, D. (2007). Do core and non-core cash flows from operations persist differentially in predicting future cash flows? *Review of Quantitative Finance and Accounting*, 31): 29–53.
- [9] Chisini, O. (1929). Sul concetto di media. *Periodico di Matematiche*, 4:106–116.  
De Finetti, B. and Mura, B. (1995). *Philosophical lectures on probability*. Springer, New York.
- [10] Dechow, P. M., Kothari, S., and Watts, R. L. (1998). The relationship between earnings and cash flow. *Journal of Accounting and Economics*, 25: 133–168.

- [11] Epstein, B. and Jermakowicz, E. (2007). *Interpretation and Application of International Financial Reporting Standards*. John Wiley and Sons, Hoboken, New Jersey.
- [12] FASB (1987). *Statement of Cash Flows*. Statement of Financial Accounting Standards. Financial Accounting Standards Board, 95.
- [13] Foster, T., Mc Nelis, L. K., and Smith, W. (2012). The statement of cash flows: an indirect to direct conversion tool to enhance user understanding and analysis. *Journal of accounting and finance*, 12):94–119.
- [14] Gentili, L., Giacomello, B., and Girardi, D. (2013). Budgeting model and system simulation: a dynamic approach. *International Center of Business Research*, 3:17– 35.
- [15] Hughes, M., Hoy, S., and Andrew, S. (2010). Cash Flows: The Gap Between Reported and Estimated Operating Cash Flow Elements. *Australasian Accounting Business and Finance Journal*, 4(1): 96-114.
- [16] RiskMetrics (1999). *Corporate Metrics TM*. Technical Document, New York: Risk Metrics Group.
- [17] Stein, J., La Gattuta, D., and Yougen, J. (2001a). A comparable approach to measuring cash flow-at-risk for non-financial firms. *Journal of Applied Corporate Finance*, 13(4): 100–109.
- [18] Yan, M., Hall, M., and Turner, P. (2014). Estimating liquidity risk using exposurebased Cash-Flow-at-Risk approach: an application to the UK banking sector. *International Journal of Finance and Economics*, 19: 225–238.