

Calculating Failure:

The making of a calculative infrastructure for forgiving and forecasting failure

Liisa Kurunmäki and Peter Miller

London School of Economics and Political Science

Forthcoming: *Business History*, 2013

Calculating Failure:

The making of a calculative infrastructure for forgiving and forecasting failure

“The machine was there; and because it was there, it had to work, and once it was running, it began to accelerate.”

(Musil, 1979 [1930], p. 265)

This paper examines how the category of failure was economised and made calculable. It explores the preconditions for this shift in three stages. First, it explores how failure came to be ‘forgiven’ in both the U.S. and the U.K. across the nineteenth century, how it came to be defined as something that is economic or financial, rather than personal or moral. Second, it explores the rapid growth of narrating and rating failure in the mid nineteenth century, with particular attention to the formation of credit rating agencies from the 1840s onwards. We consider also the roles played in this process by two fortuitous technological developments – the typewriter, and carbon paper for copying. Third, we examine the emergence of the calculative infrastructure which has helped to establish an industry of attempts to forecast failure from the beginning of the twentieth century, initially on the basis of financial ratios, and more recently through the use of risk indexes. We use the term ‘calculating failure’ to describe this transformation and economisation of both the ideas and the instruments of failure, and suggest that this has significant implications for the study of strategy.

Introduction

The category of failure now saturates public life. This emphasis on the flipside of strategy is unsurprising, given the scale of the economic crisis now facing us. But the phenomenon both pre-dates and extends far beyond current corporate failures, the potential failure of entire national economies, or even the possible failure of sets of interdependent economies. Notwithstanding a century and more of attention to corporate failure, the category of failure now has an even larger territory. Across the past two decades or so, the notion of failure has been applied also and increasingly to public services such as schools, hospitals, social work, prisons, universities, and much more besides (Kurunmäki & Miller, 2011). Here, the notion of exit has become the watchword for those seeking to assess and regulate in the name of markets, where strategies sometimes succeed and sometimes fail.

This paper examines the preconditions for this generalisation and economisation of the idea of failure. It explores how failure came to be ‘forgiven’ across the nineteenth century in both the U.S. and the U.K., in particular through repeated bankruptcy legislation. It examines how the narrating and rating of failure burgeoned from the 1840s onwards, and the role played in this process by two fortuitous technological developments – the typewriter, and carbon paper for copying. And it shows how the subsequent industry for the forecasting of failure which emerged from the early twentieth century onwards was made possible by the creation of an elaborate chain of calculations – much of it based on accounting numbers. We use the term ‘calculating failure’ to describe this transformation and economisation of both the ideas and the instruments of failure. And we use the term calculative infrastructure to designate the relatively stabilised chain of accounting calculations and associated narratives, the ensemble of calculative technologies and rationales that has come to appear necessary for the assessment of both failing and failure (Miller, 1994a, 2001; Miller & Rose, 1990).¹ Today, and after a process that extends back to the mid-nineteenth century, and that took place at a somewhat different tempo on both sides of the Atlantic, failure has become something that is economic or financial, rather than a personal or

moral phenomenon. As cultural historians have recently shown, in the early nineteenth century failure was still deeply personal, encapsulated in the term ‘loser’ and other associated terms (Balleisen, 2001; Mann, 2002; Sandage, 2005). The various attempts during the nineteenth century to figure out whether and how to forgive failure were not only economic and legal matters, but were profoundly cultural. This redefinition of failure as economic rather than moral, as arising from risk rather than sin, was a key part in the forming of a liberal economy (Miller & Power, 1995). The economic domain had, as it were, to be constituted *qua* economic domain (Hirschman, 1977). This required an acceptance of the idea that the vicissitudes of capitalism could lead to personal failure despite hard work. But it required more than a transformation of the idea of failure. It required also a set of practices and processes for orderly and equitable exit from the market game (Carruthers & Halliday, 1998, p.29). Further, it required the forming of an entire calculative infrastructure, a complex chain of calculative practices and their associated rationales, for predicting and pronouncing failure. Accordingly, we examine here both the transformation of the idea of failure, and the forming of a reciprocally related chain of calculations – including credit rating, financial statements, ratio analysis, and risk indexes – through which failure has been made calculable.

In calling for attention to be paid to the forming of this calculative infrastructure, some words of clarification and caution are appropriate. First, and notwithstanding several decades of social constructivism both within accounting research and beyond, as well as a decade or so of performativity among economic sociologists, it remains important to emphasise that the actual moment of failure has none of the objectivity and inevitability typically attributed to it (Miller & Power, 1995). That moment surfaces within and through an assemblage of calculative practices, financial norms, legal procedures, expert claims and modes of judgment. These allow complex processes of mediation between a variety of actors, domains and desired outcomes. This is of course not to deny that failure, when it occurs, often has devastating implications for individuals, families, towns, regions and even entire economies or sets of economies. Nor is it to trumpet the

virtues of constructivism relative to realism. For failure, one might say, is a variable ontology object. It is resolutely real for those who lose their jobs, their homes, their incomes, their savings, or their pensions. But it is also undeniably constructed through the multiple ideas and instruments that set the parameters within which open-ended yet not limitless negotiation and judgment takes place, as the moment of failure is either predicted or pronounced. The more this process of construction takes place, and the more it is stabilised, the more real it becomes. When this process of construction reaches a certain point, the realities of unemployment, bank repossessions, child malnutrition, and much more besides present themselves uncompromisingly.

Second, and correlatively, it is important to distinguish between failure and failing, a distinction internal to regulatory and policy discourses, and itself subject to multiple processes of judgement, interpretation and mediation. Failing is often a protracted process with no necessary end point, and certainly no inevitability that actual failure will follow.² Failing precedes the moment of death, and interventions directed at those entities considered to be failing may delay further decline and avert failure. The notion of failing goes hand in hand with a whole set of devices and processes for assessing performance, comparing it with the performance of others, deciding what problems exist, assessing how severe they are and whether they can be remedied, and setting out what might be done to alleviate or overcome them, whether this be refinancing, the devising of a new ‘strategy’, closures, forced disposals, direct or indirect government support, or whatever. In contrast with the finality and gloom of failure, and despite its negative connotations, the notion of failing has a residually optimistic dimension, for it entails at least the possibility of cure. Also, failing is about prediction rather than pronouncement. It is about the future rather than the past. For more than a century, a range of agencies have sought to develop tools for assessing the propensity of an entity to fail, whether to assess credit-worthiness or the likelihood of default. Long established for the corporate world, these predictive instruments are now surfacing in domains such as healthcare as part and parcel of a much broader economisation of the entire social field (Kurunmäki & Miller, 2011).

Third, a principle of delimitation is in order. By suggesting a focus on the generalising and economising of failure, our concerns do not extend to all and any case of failure. We are concerned only with those domains that have been largely or significantly economised, or that are in the process of being so transformed, and to which the term failure has been attached. Equally, and in so far as our concern is with a set of calculative practices whose components have spread beyond the domain of corporate failure, our concern here does not extend to the consumer credit scoring industry that others have so fruitfully examined (Jeacle & Walsh, 2002; Poon, 2007, 2009). Our focus, rather, is on the idea of failure viewed as an economic event pertaining to an entity or entities, and the chain of calculations – particularly financial statements, ratio analyses, and risk indexes – through which it is both predicted and pronounced.

Fourth, it is worthwhile noting the continuing and still growing importance of the category of failure in liberal societies. Here, the generalisation and economisation of failure is part and parcel of an ongoing process of marketisation. It is difficult to separate the language and metrics of failure from the aspiration to extend the market game for public services to its natural conclusion – the point of exit. In so far as public services are designed increasingly according to the rules of the market game, it seems that the entities providing them now have to be allowed to fail according to the same rules. At least in principle, bankruptcy law in some shape or form may now be equally applicable to public services as well as the corporate world (Kurunmäki & Miller, 2011). For the regulation of these very different domains is circumscribed by the need, in a liberal society, to ensure transparent and equitable arrangements for identifying failings and pronouncing on failure, yet without giving rise to a limitless expansion of the domain of regulatory intervention. Such developments have only been made possible by a century and more of transformations of the ideas and instruments of failure for the corporate sector, which have now become the template for an attempted economisation of the entire social field. It is these transformations that we consider in this paper, for these have provided the conditions of possibility for the current attempts to economise as much of the social field as possible.³

We examine these issues in three stages. First, we consider the ‘forgiving’ of failure, which took place at differing speeds in the U.S. and the UK through repeated legislation on bankruptcy across much of the nineteenth century. Second, we examine the rapid growth in the narrating and rating of failure from the 1840s onwards, with particular attention to the formation of credit rating agencies. Third, we examine the emergence from the early twentieth century onwards of a calculative infrastructure that has founded an entire industry of attempts to forecast failure, initially on the basis of financial ratios, and more recently through the use of risk indexes.

Forgiving Failure

The initial step towards the economising of failure was the forgiving of failure, a faltering process that took place in the U.S. and the UK across much of the nineteenth century. In the early decades of the nineteenth century, failure was deeply personal and moral, as encapsulated in the term ‘loser’ and other comparable labels.⁴ A hundred years before the Great Crash of 1929, American men were already jumping out of windows, preferring death at their own hands to a life of disgrace. But, if the terms failure and loser went hand in hand, in so far as they tallied the economics of capitalism and personal identity, and if such categories are intrinsic to the cultural history of capitalism, there was also a movement that sought to forgive failure through an economising of personal identity and recognition of this in law. Throughout the course of the nineteenth century, and with many halts and reversals on both sides of the Atlantic, it came to be accepted in law that failure might arise from risk rather than sin. Put differently, the gap between rectitude and reward, character and failure grew increasingly (Sandage, 2005, p. 15). It was gradually accepted that the vicissitudes of capitalism could result in failure, despite honest dealings and hard work.

This changing meaning of failure was given substance through legislation. Initially, and in the U.S., this was through the short-lived U.S. Bankruptcy Act of 1800 (Mann, 2002).⁵ This was given a five-year term by Congress, but it was repealed after only three years (Warren, 1935,

p.19). Despite subsequent perennial debates, no further federal legislation was passed until the Bankruptcy Act of 1841. This, too, was short-lived, and it was repealed only two years after being enacted. The 1841 Act introduced for the first time the principle of voluntary bankruptcy, and covered all individuals, not just merchants and traders.⁶ But the 1841 Act had come under attack even before it went into operation, and within little more than a year it was repealed (Warren, 1935, p.85). A quarter of a century passed before Congress enacted another bankruptcy law (Coleman, 1999, p.23). The 1867 Bankruptcy Act, approved on the same day as the Reconstruction Act (the first of four major provisions for readmitting former Confederate states) promised a kind of national citizenship that meant that economic failure would no longer result in individuals losing their capacity to transact. This was a further important step in the economising of failure, albeit one that was to last only a little more than a decade.⁷ Nonetheless, as Sandage (2005, p. 223) eloquently puts it, the civil war ‘changed the terms of political and economic activity in ways that expanded the constituency of failure’. ‘Liberty and slavery’ gave way to ‘success and failure’, as new measures of human worth. In the post-war decades, this ‘new birth of freedom’ brought forth a ‘new birth of failure’. Failure was no longer indelibly inscribed in the character of an individual, but was a function of a more circumscribed economic domain, and one whose contours could be quantified. Although the 1867 Act was repealed in 1878, the Act of 1898 reaffirmed the link between solvency and selfhood as conjoint speculative ventures (notwithstanding further reversals). The enduring nature of the Bankruptcy Act of 1898, which enshrined five fundamental principles, ensured that success and failure could be viewed as just two sides of the liberal ideal that reshaped notions of selfhood in postbellum America (Coleman, 1999, p.29).⁸

In England, the shift in meaning was comparable, even if the chronology differed somewhat and even if the resulting systems and professional jurisdictions are substantially different (Skeel, 2001). The Bankruptcy Act 1831 radically changed the institutional and legal framework for dealing with insolvency by the establishing of a Court of Bankruptcy in London

and the creation of a new figure, the official assignee (Di Martino, 2005).⁹ The Winding-Up Act of 1848 regulated the control of liquidations, and made the appointment of a public accountant a virtual necessity (Jones, 1981, p.45; Matthews et. al., 1998, pp.30-31). The Bankruptcy Act of 1861 permitted debtors to absolve themselves of their liabilities¹⁰ by making themselves voluntarily bankrupt. The Companies Act 1862 – often referred to as the ‘accountant’s friend’ – established the position of ‘official liquidator’. And the Debtors Act 1869 reduced the ability of the courts to detain those in debt, although some provisions remained (Hall Williams, 1970).¹¹ With this shift, insolvency became a business in and of itself, and provided the core activity and source of revenue during the second half of the nineteenth century for the newly emerging accounting profession (Matthews et. al., 1998, pp. 30-31). From then on, and notwithstanding some changes introduced in the 1883 Act, including a new procedure called ‘public examination’,¹² imprisonment was to be reserved for the punishment of crime, and not the lot of misfortune in trade.¹³ The system put in place with the Bankruptcy Act of 1883 remained in place for just over a century, and provided the structure for the supervision and administration of bankruptcy until the passage of the Insolvency Acts of 1985 and 1986 (Lester, 1995, p.2).

However, before the economisation of failure could be fully operationalised, a new set of metrics for forecasting failure had to be devised, together with the financial information on which they could be based. And before this could happen, a prior shift was required, the forming of an information infrastructure for narrating and rating failure. Accordingly, in the next section we consider the emergence, from the 1840s till the final decade of the nineteenth century, of an entire new industry for the conjoint narrating and rating of failure.

Narrating and Rating Failure

Forgiving failure is one thing, forecasting it another. The two things developed in close parallel, however. An initial step in this process was the establishing of a vast information infrastructure, albeit one that to begin with neither quantified failure nor rendered its likelihood probabilistic.

Lewis Tappan's Mercantile Agency, a direct ancestor of Dun & Bradstreet, began this process on 1st August 1841, when it opened its doors in lower Manhattan (Foulke, 1941). This was just four years after the worst depression till then in the U.S.. The Agency sold 'information with regard to the credit and affairs of every man of business', and quickly established itself as a 'kind of intelligence office for the whole country', in the words of Henry Thoreau.¹⁴ The Mercantile Agency sought to manage risk and forecast failure by recording and managing identity, and on a scale that hitherto had not been imagined. Tappan, an ardent social reformer, quickly established an information infrastructure for the newly emerging national markets, which themselves were supported by increased speed of transport and communication. Such technological developments as telegraphy, the railroads, and steamboats had not been matched by an information infrastructure that would allow assessments of credit-worthiness to those that were distant and anonymous.

The Mercantile Agency emerged at a time when few other national economic institutions existed. It depended entirely on local informants who, in lieu of payment, received a portion of any debt collected from local defaulters. Within five years of its creation in 1841, Tappan had enlisted 679 local informants, and this had reached two thousand by 1851 (Foulke, 1941, p.309; Sandage, 2005, p. 101). In that year, the inflow of information kept thirty clerks busy – on an average day, the firm received six hundred new or updated reports, and answered four hundred enquiries. From then on, the national marketplace had an institutional memory, one that blended morals, finances, past performance and future prospects into a summary judgment that depicted and managed identity case by case (Sandage, 2005, p. 103).

This network of 'correspondents' continued to grow across the remaining decades of the nineteenth century and into the twentieth century, such that by 1941 there were 50,000 in the U.S. and 8,000 in Canada (Foulke, 1941, p.309). Many criticised the network of informants as little more than snoopers, snitches and spies, but Tappan defended them ardently (Madison, 1974, p.169). None the less, the agency shielded informants behind code numbers, and typically did not

copy their names into its volumes. Correspondents were expected to send updates every six months, answer urgent queries, and warn of imminent collapses. ‘Failed & now in Boston’ stated a typical entry in 1848 about a tailor who absconded from Worcester; ‘be sure & never trust him, will always be worthless.’ (quoted in Sandage, 2005, p. 111). A somewhat hedged report in 1854 from Ohio stated: ‘I think he will fail before long if he has not already’, and a Cincinnati agent wrote in 1862 ‘the impression here is that they are bound to go under’ (Sandage, 2005, p. 153). A report in 1860 in Jackson County, Alabama, stated: ‘The general opinion here is, that he is in a v[er]y critical and embarr[asse]d condition, and that there is a strong probability of his *failure*’ (quoted in Sandage, 2005, p. 111, emphasis in original). So, while the law concerning bankrupts oscillated throughout the nineteenth century, sometimes punishing and sometimes forgiving failure, credit agencies sought to predict failure, albeit in a manner that today appears unfamiliar.¹⁵

By the 1860s, ‘bad egg’ was typical of the plain-speaking terms used in the credit reports that made failure indelible and a commodity. But rating and narrating at this time remained inseparable – Americans had not yet learned to think of each other simply as numbers (Sandage, 2005, p. 130). And, even after three decades of the Mercantile Agency, credit reports were still not standardised. As late as 1869, the firm assumed that the wisdom of its informants was such that they did not need to be told ‘what to look for’ (Sandage, 2005, p.155).

Nonetheless, the late 1860s and the 1870s brought significant changes, and set the stage for the subsequent and more enduring economising of failure in the following decades. First, and on a scale that may appear rather modest today after a century and more of standardisation, there were attempts to standardise credit reports. It is worth recalling that the typical credit reporter in the U.S. at this time was someone – often English, Scottish or Irish by birth – who would ride or trudge from town to town in a harsh and sometimes perilous environment (Foulke, 1941, p. 335). Much of the time of credit reporters was spent chatting with traders, bankers, sheriffs and tavern keepers. Reports would be mailed once per week, and one credit reporter related that he ‘didn’t

see his superior for a year' (cited in Foulke, 1941, p. 335). Credit reports for small and remote communities were typically brief, financial statements were rarely obtained, and trade information was negligible (Foulke, 1941, p. 335). Retailers at this time in the U.S., particularly in the more remote regions, issued very few balance sheets or income accounts. While a small but growing number of ordered financial statements appeared in the larger eastern communities in the 1870s and 1880s, the credit reporter in the western and southern states could do little more than guess at the assets and liabilities of retailers on the basis of the immediate goods on the shelves, the cash on hand, and liabilities due to one or two principal suppliers.

In an attempt to standardise such reports, instructions were sent out in 1869 to the correspondents of The Bradstreet Company (Foulke, 1941, p. 349), requiring them to itemise length of time in business, amount of own capital in business, estimated net worth after liabilities, the composition of estimated wealth (real estate, personal property, stocks etc), character (good, fair, poor), habits (good, medium, poor), business qualifications (very good, good, medium, poor), prospects of success (good, fair, medium, poor), who they succeeded, and the names of partners, together with their age. This was, apparently, the first attempt to standardise and itemise the information required to analyse the moral and financial character of individuals seeking credit. Until then, this was done more according to habit or instinct of those filing the reports. None the less, it demonstrates the extent to which rating and narrating still went hand in hand well into the second half of the nineteenth century, and also how closely linked were moral and financial identity at that time.

A second step in the development of credit reporting in the last quarter of the nineteenth century took the form of two related and fortuitous technological developments – that of 'machines for writing with type', and carbon paper for copying.¹⁶ In 1841, the first credit reports were written down by hand in huge ledgers by expert 'scriveners'. When a subscriber desired credit information, he called at the office of the Mercantile Agency, and the information in the ledger was read to him by one of the clerks. The subscribers received the information verbally,

and had to remember it as accurately as possible. Subsequently, this routine was modified, and reports were copied by pen and ink from the ledger pages and mailed or delivered to subscribers. In 1872, however, the first credit report was reproduced by carbon paper, after several years of experimentation to create a duplicating medium by applying shoe polish to yellow foolscap paper (Foulke, 1941, p. 374). In 1875, the first commercial order ever given for typewriters was placed by the Mercantile Agency. The order was for one hundred machines, at a total price of \$5,500, and was placed with Christopher Latham Sholes who, for many years had been trying to interest businesses with his invention but with no success (Foulke, 1941, *ibid.*). The machines to fill this first order were manufactured by E. Remington & Sons of Ilion, New York. They became known as the model Remington No. 1. These twin developments – the typewriter and carbon copying – revolutionized the small-scale reproduction of documents at their point of origin, and transformed the possibilities for recording and reselling credit reports.

The credit-reporting industry prospered in the decades following the Civil War, and by 1880 R.G. Dun and the Bradstreet agency were a clear duopoly in the field of national credit reporting.¹⁷ The suspension of ‘specie’ payment (coined money) from 1862 to 1879 increased the demand for credit reporting, credit periods shortened, and credit terms became more specialized, with items such as jewellery commanding longer credit periods than canned goods, which in turn commanded more time than perishable items such as fresh fruits and vegetables (Olegario, 2006, p. 140). The number of full-time credit reporters increased, and they began to specialize, at least in the larger cities. By the end of the nineteenth century, nearly all manufacturers and wholesalers used the information provided by the credit-reporting firms, with one estimate stating that approximately 70 per cent of all orders were shipped based on agency reports (Olegario, 2006, p. 191). That said, the methods used for assessing credit-worthiness remained little changed between 1865 and 1890.¹⁸ Although full-time reporters covered the more densely populated areas of the United States, in other areas the agencies continued to depend on the reports of local attorneys, postmasters, bank cashiers, and merchants.

Forecasting Failure

In the 1890s, pressure began to build for a move towards forms of credit analysis that would make possible ways of forecasting failure, calculating its likelihood rather than assessing it on the basis of personal intuition and rumour. The birth of the ‘credit man’ was central to this shift, which went hand in hand with the emergence of the large multi-unit corporation. Towards the end of the nineteenth century, large manufacturers and wholesalers in almost all industries began to employ ‘credit men’, individuals whose only responsibility was to assess the credit-worthiness of existing and prospective customers. This began the process of separating rating and narrating, and the transforming of uncertainty into calculated risk. As one proponent of the new ‘profession’ of credit men claimed: ‘That credit man excels who, taking what looks like a long chance, by such mental means and systematic methods as he possesses shortens the chance and brings it to the point of safety’ (cited in Olegario, 2006, p. 175).

Before 1890, ‘credit men’ had begun to form local associations to share information and work out ways to deal with insolvents. The Panic of 1893, however, acted as a trigger for the formation of a national group – the National Association of Credit Men (NACM). Formed in Toledo, Ohio, in 1896, on the basis of a nucleus of ten existing local associations, it was incorporated in New York State the following year. Despite hesitation and suspicion on the part of credit-reporting firms, attorneys, associations of retailers, and even credit men themselves, the new organization attracted six hundred members initially. This trebled during the first year, and by 1920 the NACM could claim a membership of over thirty-three thousand, making it one of the largest commercial organizations in the world at the time.

The NACM sought to enhance the status of credit expertise in a variety of ways, by claiming unique technical skills and benefits to society, as is customary with newly emergent bodies of expertise. It sought also to transform the domain of credit assessment by calling for it to be represented as an economic domain, and by making it susceptible to financial calculations.

This was a challenge, however, since the majority of small manufacturers and traders in the U.S. at the end of the nineteenth century were unable to calculate the extent of their liabilities or assets, and were similarly unable to assess whether their business was profitable.¹⁹ As one report stated:

You will find in his store a couple of spindles, on one of which he puts the bills as they come in, while on the other he puts the bills as he pays them. He may also have a blotter in which he records the sales he makes on credit. (cited in Olegario, 2006, p. 181).

The NACM sought to counter this lack of financial information by publishing a range of manuals, pamphlets and newsletters. They even went as far as to recommend distributing a pamphlet to retailers outlining a simple method for keeping accurate accounts, and prizes were offered for the best essays on simple and effective methods of bookkeeping and accounting for retailers. The NACM called for a standardising and an economising of the information on which credit reports were based. The NACM published the first manuals on credit management, and shaped the way credit reporting was to be understood in the early decades of the twentieth century. The first of these manuals, titled *Whom to Trust*, and written by credit man Peter Earling from Chicago, was published in 1890 (Earling, 1890). In that manual, Earling called for a ‘better understanding of the “Science of Credits”’, and sought to point out ‘the causes that lead to success or failure’ (Earling, 1890, p. 13). The aims of the NACM went beyond the relatively modest aims of the federal regulators of the time. In 1897, they called for signed statements from all businesses. A decade later, having joined forces with the American Bankers Association, they supported calls for audited financial statements to be made more widely available, and worked together to pass laws in every state punishing debtors who submitted false statements whether to creditors or credit-reporting agencies (Olegario, 2006, p. 179). The NACM called for greater uniformity of financial statements, arguing that this would allow investors and creditors to compare businesses more easily.²⁰ Such arguments were in line with the arguments of the Progressive Reformers,

who had begun with attempts to standardise municipal accounts (Olegario, 2006, p. 179).²¹

Federal officials supported this, and sought to expand the practice into the private sector.

Accountants, ironically, were less enthusiastic, fearing that a system of standardised accounts in the private sector would not be consistent with the multiple users and multiple objectives of financial reporting.²² Undeterred, the NACM developed and sold 'uniform statement blanks', and by 1899 was able to report that 133 firms were using the forms.

These developments greatly facilitated the forecasting of failure. In particular, they supported the spread of ratio analysis, a 'second order' set of calculations that were made possible by the greater availability and increasing uniformity of financial information that began to occur from the late 1890s. The current ratio – current assets divided by current liabilities – gained acceptance at this time, for it allowed creditors to predict the likelihood that a firm would fail as a result of inability to meet payments (Horrigan, 1968, p. 285). Banks began to rely heavily on this ratio as a basis for approving loans (Dev, 1974). The '50 per cent rule' was widely touted – this dictated that a borrower's current liabilities should not exceed 50 per cent of current assets. The NACM's *Bulletin* set out similar guidelines in 1902, and in 1905 James Cannon, president of the Fourth National Bank of New York, and an early president of the NACM, recommended a set of ratios in a paper to the New Jersey Bankers Association (Cannon, 1905).

Ratio analysis gained momentum rapidly, once traders and manufacturers could be represented as economic entities through financial statements. This occurred in the very early years of the twentieth century (Brown, 1955). In 1897, the NACM reported that over eighty per cent of all reports were still not based on any financial statements whatsoever. Five years later, things had developed significantly, the figure being reduced to nearly sixty per cent (Olegario, 2006, p. 193). The NACM continued to argue for the critical importance of financial statements, even going as far as to recommend that agencies withhold capital ratings from businesses that refused to submit them. Gradually, across the first two decades of the twentieth century, the idea that failure should be viewed as calculable and probabilistic took hold, even if credit men still

held to the axiom that creditworthiness was determined by the ‘three C’s’: character, capacity, and capital. In so far as honesty remained the foundation for the reliability of financial statements, the ‘honest failure’ should be forgiven also (Olegario, 2006, p. 199).

Once the machinery of ratio analysis was up and running, it could be put to work. And, once put to work, it gained momentum. In 1905, Cannon, a pioneer of financial statement analysis, spoke of the ‘rules of the credit science’ and the rationale for the 2:1 current ratio – that companies were looked at more from a liquidation angle, than as going concerns (Cannon, 1905). And, despite endorsing the current ratio as a basis for assessing loans, he used as many as ten ratios in a study of business borrowers. The following decade saw this multiplying of ratios given significant publicity and legitimacy. In 1912, Alexander Wall, of the National Bank of Commerce, Detroit, was asked by the Division of Analysis and Research of the Federal Reserve Board, to prepare a report on the topic of credit and credit-worthiness.²³ In a highly influential study titled ‘Credit Barometrics’, and published in the Federal Reserve Bulletin in 1919, Wall computed seven different ratios of 981 firms, stratified by industry and location, and detected significant variation (Wall, 1919). This was a major step forward in the development and diffusion of ratio analysis, for it marked a departure from the then customary usage of a single ratio.

In the wake of Wall’s ‘credit barometrics’, there was an explosion of publications on ratio analysis during the 1920s. Trade associations, credit agencies, individual analysts, and academics all sought to contribute to what was termed ‘scientific ratio analysis’.²⁴ Wall himself, in an effort to address the proliferation of ratios, developed an index of ratios. This was effectively a weighted average of a range of ratios, with the weights being the relative value attributed to each ratio by the analyst (Wall & Duning, 1928). In a similar vein, Bliss (1923) developed a model of the firm that consisted entirely of interlinked ratios. And soon critics began to appear. Wall was heavily criticized for his efforts, one particularly acerbic critic describing him as the ‘incurably optimistic theorist futilely and absurdly chasing the ratio absolute’.²⁵

Another critic, Gilman (1925), argued that ratios did not portray ‘fundamental relationships within the business’.²⁶

Despite such criticisms, the development of ratio analysis continued unabated during the 1930s. This was no doubt aided by the increased supply of financial statements, and the formation of the U.S. Securities and Exchange Commission (SEC) in 1934, in response to the stock market crash of 1929. The SEC in fact began to publish ratio data of its own, as did the National Credit Office in the late 1920s under the guidance of Foulke, who published a group of ratios that eventually numbered fourteen (Horrigan, 1968, p. 288). The latter were not widely promulgated, however, until the 1930s, by which time Foulke had moved to Dun & Bradstreet.²⁷ The publication of these ratios was begun in 1933, in the *Dun & Bradstreet Monthly Review*, and they quickly became the most influential and well-known industry average ratios (Horrigan, 1968, p. 288).

A further step was required, however. This was to make failure calculable, by linking ratio analysis explicitly and empirically to the likelihood of failure. This was, of course, implicit in the liquidation principle built into the 2:1 current ratio. But, as late as 1930, the selection of ratios remained largely justified on the basis of experience and judgment, and there was little or no empirical testing of the reliability of individual ratios as predictors. This was to change, however, in the early 1930s when a range of studies sought to ‘predict’, *ex post*, the likelihood of failure on the basis of a variety of ratios.

Numerous studies sought to identify those ratios which could serve as reliable predictors of failure. Fitzpatrick (1931) studied twenty nationally known companies that failed during the 1920s. He calculated thirteen ratios for each company for several years before failure, and ranked four as being the best indicators of impending failure. In a second study, he compared each company’s ratios with those of a comparable successful company, and identified three ratios as being better predictors than the current ratio and quick ratios²⁸ (Fitzpatrick, 1932). Smith and Winakor (1930, 1935) studied 183 failures between 1923 and 1931, and identified substantial

variations in the ratios when analyzed according to industry and firm size. Ramser and Foster (1931) studied 173 companies that sought permission to sell securities in Illinois between 1919 and 1925, and claimed to detect differences in the ratios between those that failed by 1927 (about 30 per cent) and those that did not. And, in 1942, Merwin published the results of a comparable study, that analyzed a large number of ratios calculated from the accounts of 582 ‘continuing’ and ‘discontinuing’ small companies in five manufacturing industries. By comparing these ratios with industry mean ratios, he claimed to detect predictors of ‘discontinuance’ as much as four or five years prior to failure.

The ideas and instruments of failure act like a multiplying machine, a constantly proliferating assemblage of actors, agents, practices, tools, instruments and ideas that is defined by the temporarily stabilized relations between its constituent parts. By the 1940s, a large and diverse set of actors had come together to predict and pronounce on failure. This included accountants and their professional associations, bankers and bank credit men, credit men, credit rating agencies, lawyers, trade associations, labor unions, professional educators, university professors, corporate management, as well as a panoply of regulatory bodies, including the Interstate Commerce Commission, the Internal Revenue Service, the Securities and Exchange Commission, the Board of Governors of the Federal Reserve System, and the Federal Deposit Insurance Corporation. While all pursuing their own discrete agendas and aspirations, and while also vying for prominence and claiming a distinctive expertise or toolkit, this assemblage of actors had in common the aspiration that failure was something that could be known, acted on, and made calculable, with beneficent results for firms, creditors, investors and society at large, as well as for those that simply aspired to be able to identify failing organizations and predict the likelihood of their failure.

Much has of course changed since the early 1940s. But, by then, and in the U.S., the contemporary landscape for thinking about and calculating failure was largely in place. Failure could be forgiven, both legally and morally. Or at least honest failure could be. It could be made

calculable and predicted, even if the actual predictions (then, as now) were rather shaky. The calculative infrastructure on which ratio analysis depended was legally mandated, at least for listed companies.²⁹ And, on top of the first order financial statements produced by firms, and the second order ratios constructed out of them, a third order of metrics – indexes of ratios – had emerged as part of the chain of calculations for seeking to forecast failure and identify the characteristics of failing organizations.

After a gap of two decades or so, the predicting of failure became an academic industry, one that spilled over into a set of adjacent industries, including banking, credit rating, and financial services more generally. A swarm of researchers appeared in the 1960s, many based at the University of Chicago, united by the common goal of predicting failure, and identifying the characteristics of failing and failed companies (Balcaen & Ooghe, 2006; Barnes, 1987; Dev, 1974). Beaver (1966) defined failure as a company defaulting on interest payments on its debt, overdrawing its bank account, or declaring bankruptcy. To ‘predict’ failure, he matched a sample of failed firms with a sample of non-failed firms, and studied their financial ratios for a period of up to five years before failure, and concluded that three ‘non-liquid’ ratios were the best predictors of failure, even for the year prior to failure, a finding that was reinforced even when he extended his study two years later (Beaver, 1968).³⁰ In parallel, and outside the US, Tamari (1966) compared the ratios of failed companies with those of all Israeli industries, and concluded that there were significant differences. He cautioned against relying on one ratio alone, and constructed a risk index similar to that compiled by Wall and Duning (1928) over three decades earlier. After assigning weights in a fairly rudimentary manner, he concluded that his index made it possible to discriminate between companies that subsequently failed, and those that did not. Moses and Liao (1987) pursued a similar line of enquiry some two decades later. Meanwhile, others such as Altman (1968) moved away from univariate techniques, and towards multivariate statistical techniques such as multiple discriminant analysis, which took into account a number of ratio characteristics at the same time. One influential such model was the Z-score model, which

was to be successfully marketed for credit analysis, investment analysis and going-concern evaluation. This was extended in the 'Zeta' model, which took account of changes in financial reporting standards (Altman et al, 1977). Subsequent studies, pioneered by Ohlson (1980), developed conditional probability models based on non-linear methods to estimate the likelihood of failure.

Notwithstanding the nuances of the varied statistical models used, which matter greatly to those seeking not only to improve the predictive powers of their model but also to establish product micro-differentiation in the academic marketplace, the chain of calculations deployed in recent decades in attempts to predict failure have much the same contours as those developed several decades earlier. The building blocks – financial statements, ratio analyses, and indexes of ratios, however subtly computed – all remain in place, much as they were in the late 1930s and early 1940s. Even a sympathetic recent review of the literature has cautioned, in a review of nearly 150 studies conducted over a period of 35 years, against 'over-modelling', and has drawn attention to the arbitrary definition of failure typically used in predictive studies.³¹ However, our interest here has been less to do with assessing the progress of this calculative juggernaut, and more to do with charting the huge number and range of studies that have been undertaken by both academics and practitioners across the past half century or so in attempts to predict corporate failure. For the creation of this vast machinery with its incessant forecasts is an integral part of the calculative infrastructure that has facilitated the economizing and generalising of failure.

Conclusion

Today, the notion of strategy is everywhere. Strategy provides one of the dominant narratives for demonstrating the rationality of organizations to external bodies such as regulators and analysts, and internal bodies such as boards. We have reached a point where it is almost impossible to imagine organizing without strategy. The assessment of an organization's strategy, however, is inseparable from the calculative infrastructure that we have examined here. Risk indexes, credit

ratings, Key Performance Indicators, and suchlike are the metrics through which the success, or otherwise, of a strategy is assessed. Put differently, failing and failure – the obverse of a successful strategy – are always lurking in the wings. We have documented here the forming of an elaborate calculative infrastructure for seeking to identify failing and forecast failure. Scholars of strategy, we suggest, need to pay increased attention to the range of calculative devices through which strategy is both articulated and assessed.³² For it is typically through such metrics that the continuance, or otherwise, of organizations is decided. This economising of failure is thereby an economising of strategy, regardless of the gloss that may be provided by multiple strategic priorities.

We are witnessing today a generalising of this idea of failure, so that it is something available equally to all. Whether in the private sector or in public services, it seems that failure is ubiquitous. We have examined here the preconditions for this generalising of failure, which is at heart an economising of failure. This commenced around the middle of the nineteenth century, and is now being extended to the entire social field. We have examined the various steps that were involved in this process. First, we considered the rethinking of the notion of failure, which resulted in the forgiving of failure. Bankruptcy legislation was central here, in so far as this accepted that economic failure might arise from risk rather than sin. We then examined the emergence of an entire calculative infrastructure for forecasting failure. An initial step in this direction was the rapid growth of narrating and rating failure, through the emergence in the 1840s of the vast industry of credit reporting, an industry that expanded substantially across the remainder of the nineteenth century. The invention of ‘machines for writing with type’ and carbon paper for copying, played non-trivial roles in such developments.

The forecasting of failure gained greater momentum from around the end of the nineteenth century and the beginning of the twentieth century, once credit reports were increasingly standardised and financial reports more widely available. The subsequent development of ratio analysis and risk indexes consolidated this calculative infrastructure, such

that by the 1940s much of our contemporary apparatus for forecasting failure was in place. Since then, the forecasting of failure has become a massive industry for both academics and practitioners alike, albeit without reliable means yet for extrapolating from populations to individual entities.

Our coverage of each step in the formation of this calculative infrastructure has, of necessity, been brief. But we felt it important to focus on the entire chain of calculations that is at issue here, rather than focusing only on one particular metric or instrument. For it is only by linking primary financial records to more or less standardised published financial reports that a series of second and third order calculations can be established. And, once relatively standardised financial reports exist, ratios can be calculated of them, which can themselves be multiplied. In turn, (risk) indexes can be computed out of such ratios and financial reports, so that narrating and rating can be firmly disassociated. This made it possible for commentators and analysts to focus wholly or primarily on the single figure, which is so often the end point of such chains of calculation (Miller, 1994b). Our ‘modern’ calculative infrastructure for the economising of failure dates from the moment that this chain of calculations was established and stabilised.

A final point is worth emphasising. This is the reciprocity between entity formation and the calculative infrastructure which surrounds modern economic forms, whether in the private sector or increasingly the not-for-profit sector (Kurunmäki, 1999). In place of ‘reactivity’³³, we have examined here a process of co-creation, through which a financial and legal entity has been formed in tandem with the calculative infrastructure through which it is assessed and regulated. In so far as the different components of this entire edifice fit each other, it is because they have been made to fit. Put differently, the making of markets requires the formation of the entities that populate them, together with allowance for their exit from the market game. It has taken roughly a century and a half to fashion such reciprocity, and we are still a long way from coming to terms with the implications of what has been created.

Acknowledgements

The work conducted for this paper was part of the programme of the ESRC Centre for Analysis of Risk and Regulation. Thanks are due to two anonymous reviewers, and to Chris Carter, the Editor of this special issue, for his support and encouragement. We would like to thank also participants at the Workshop on Strategy, Organization and Society, held at Copenhagen Business School, November 2011, as well as participants at the Workshop on Accounting, Law and Marketing held at the London School of Economics and Political Science, February 2012. Particular thanks go to Michael Power, who stimulated an early interest in the linkages between accounting calculations and insolvency, and to Andrea Mennicken for her comments and encouragement.

Notes

¹ One might see this as both paralleled by and extending the ‘audit explosion’ that Michael Power has so astutely examined (Power, 1997).

² On this, see Meyer and Zucker (1989).

³ On the notion of ‘conditions of possibility’, see Foucault (1970), p. xxii. See also his related notion of ‘causal multiplication’ (Foucault, 1991, p. 76). In both cases, Foucault emphasizes the multiple processes that make it possible but not necessary for something to be said or done.

⁴ Here we draw extensively on Sandage’s (2005) excellent ‘history of failure’ in America.

⁵ Mann (2002, p. 229) focuses on the 1800 Act, commenting that it was a ‘milestone in the law of failure’.

⁶ Mann (2002, p. 229) argues that the 1800 Act embodied a ‘latent voluntarism’, and Warren (1935, p.20) notes that bankruptcy proceedings under the Act were initiated by ‘friendly’ creditors.

⁷ Coleman (1999, p. 25) remarks that the act ‘collapsed under the weight of its inherent defects’, noting that it pleased no combination of supporters with enough influence to prevent its repeal.

⁸ Coleman (1999, p. 29) identifies the following five principles: first, it relieved all debts, not only those arising out of contracts entered into after the law went into effect; second, it allowed for both voluntary and involuntary bankruptcy; third, it applied to all business corporations, including national banks, but exempted farmers and wage earners from the involuntary provisions; fourth, it protected property that was exempt under state law from attachment; and fifth, it set out procedures under which insolvent debtors could have a period of grace in which to reorganize their affairs or reach agreements with their creditors.

⁹ Di Martino (2005, p. 26) notes that the introduction of ‘deeds of arrangements’ in 1825 provided for various forms of non-judicial treatment of insolvency, based on private agreement between debtors and creditors.

¹⁰ A further and important part of these developments, which is beyond the scope of the current paper, is the legislation which introduced the general system of limited liability incorporation to England. On the 1855 Limited Liability Act, and the 1856 Joint Stock Companies Act, see for instance McQueen (2009) and Djelic (2011).

¹¹ Hall Williams (1970) cites the view of the Payne Committee that reported just over one hundred years later that committal to prison for debt was ‘an outdated, often unjust and inappropriate method of enforcement’ and should be abolished (cited in Hall Williams, 1970, p. 70).

¹² This allowed creditors and the court to question the debtor under oath on the state of his affairs, and the causes of the bankruptcy (Di Martino, 2005, p. 27).

¹³ Lord Brougham Speech Law Reform, 19 May 1845, cited in Di Martino (2005).

¹⁴ Cited in Sandage (2005), p.99.

¹⁵ There were of course other ways to sort and sell identity in the 1840s. The new ‘science’ of phrenology, which was no mere fad, and endured for decades, appeared at this time. The cranial index and the credit index shared the view that likelihood of failure could be ascertained by objective measures of an individual’s identity. The opening of New York’s first photography studio in 1840, and the creation of ‘daguerrotypes’ (the first successful publicly available photographic process, named after Louis Daguerre), reinforced this possibility of capturing and classifying identity (Sandage, 2005, p.112ff.).

¹⁶ On the development of typewriters and carbon paper more generally, see the excellent analysis in Yates (1989).

¹⁷ The Mercantile Agency, founded by Lewis Tappan in 1841, became R.G. Dun & Co in 1859 when Robert Dun bought the company. In 1931, it came to be known as R.G. Dun Corporation. The Bradstreet Company, which had been founded in 1849 by John M. Bradstreet, and which competed with R.G. Dun & Co for seventy-five years, was acquired in 1933. From then on, the company was known as Dun & Bradstreet Inc.

¹⁸ It is worth noting that, from 1859 onwards, the *Reference Book* at the Mercantile Agency collected the names of all active commercial and industrial business enterprise in every city, town, village and hamlet in the U.S., together with two symbols, one before and one after each name. The first indicated the line of business activity, the second the estimated financial investment in the business and its general credit worthiness. Reference books were revised annually, with the exception of 1862 and 1863 during the Civil War when none were printed (Foulke, 1941, pp. 313-315). On this, see also Sandage (2005, p. 130), who

remarks that ‘red books’ used many scales and classifications in seeking to assess the ‘three C’s’ of capital, character and capacity, but rating at this time still required narrating.

¹⁹ McQueen (2009, p. 130) comments on the situation in England at the same time as follows: ‘...many English businesses continued to have rudimentary accounting procedures throughout the 1880s, and in some sectors well into the 1890s.’

²⁰ As Olegario (2006), p. 258 notes, businesses at this time, if they kept financial records, typically kept them for only one year before discarding them.

²¹ On this, see also Previts & Merino (1979, p. 132) who state as follows: ‘Progressive demands for efficiency in government, regulation of business, and tax reform all had positive effects with respect to the development of the profession of accountancy in the United States. For it was the independent public accountant, the disinterested expert, who could provide the necessary services to implement progressive reforms.’

²² See, for instance, the discussion in Previts & Merino (1979, pp. 184-188) of the notion of uniformity for financial statements.

²³ The report was requested initially for use by the Federal Reserve Board and the Federal Reserve Banks, but the topic was considered sufficiently important to publish the report in order to stimulate further discussion. Prior to writing the report, Wall had been appointed Chairman of the Educational Committee of the American Institute of Banking, and he accepted the post of credit manager with the National Bank of Commerce in Detroit about 1916. In 1919, he became the permanent Secretary-Treasurer of Robert Morris Associates, where he remained until his retirement in 1943 (Brown, 1955, p. 71). In 1928, while at Robert Morris Associates, he published an influential text on ratio analysis and financial statements (Wall & Duning, 1928). It is worth noting that in 2000, Robert Morris Associates decided to change its name to RMA – The Risk Management Association.

²⁴ See Justin (1924).

²⁵ Strain (1929).

²⁶ Gilman (1925), cited in Horrigan (1968), p. 287.

²⁷ Foulke stayed at Dun & Bradstreet for 40 years, retiring in 1961 from his post as a vice president and director. In 1945 he published his highly influential book *Practical Financial Statement Analysis* (Foulke, 1945).

²⁸ The quick ratio = (current assets – inventories)/current liabilities.

²⁹ Securities Act, 1933.

³⁰ These findings were particularly notable, as the early literature had emphasized ‘liquid’ ratios for short-term predictions.

³¹ As Balcaen & Ooghe note, the majority of studies adopt a juridical definition of failure, i.e. bankruptcy. This ignores the issue of ‘financial distress’, and ‘failure-related events’ such as cash insolvency, loan default, capital reconstructions, major closures, forced disposals of large parts of the firm, informal government support, and loan covenant renegotiations with bankers (Balcaen & Ooghe, 2006, p. 72). Although some studies address the latter, they point out that the criterion of failure is arbitrary, regardless of whether a juridical definition of failure or a financial distress definition is used. They note also that a second arbitrary factor is the separation of firms into failing and non-failing firms, in so far as this is always applied to a particular and arbitrarily chosen year or time period.

³² On this point, see Carter & Mueller (2006). Also, and more generally, we see our arguments here as consistent with the ‘strategy as practice’ tradition that has recently emerged (Carter et. al. 2008).

³³ On the notion of reactivity, see Espeland and Sauder (2007).

References

Altman, E.I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance*, 23 (4), 589-609.

- Altman, E.I., Haldeman, R.G. & Narayanan, P. (1977). Zeta Analysis: A New Model to Identify Bankruptcy Risk of Corporations, *Journal of Banking and Finance*, 1 (1), 29-51.
- Balcaen, S. & Ooghe, H. (2006). 35 Years of studies on business failure: an overview of the classic statistical methodologies and their related problems. *The British Accounting Review*, 38, 63-93.
- Barnes, P. (1987). The Analysis and use of Financial Ratios: A Review Article. *Journal of Business Finance & Accounting*, 14 (4), 449-461.
- Beaver, W.H. (1966). Financial Ratios as Predictors of Failure. *Empirical Research in Accounting: Selected Studies 1966. Supplement to Journal of Accounting Research 1966*, 71-111.
- Bliss, J.H. (1923). *Financial and Operating Ratios in Management*. New York: The Ronald Press Company.
- Brown, I. (1955). *The Historical Development of the use of Ratios in Financial Statement Analysis to 1933*. PhD Dissertation, Catholic University of America.
- Carruthers, B.G. & Halliday, T.C. (1998). *Rescuing Business: The Making of Corporate Bankruptcy Law in England and the United States*. Oxford: Clarendon Press.
- Carter, C. & Mueller, F. (2006). The colonization of strategy: financialisation in a post-privatisation context. *Critical Perspectives on Accounting*, 17: 967-985.
- Carter, C., Clegg, S. R., & Kornberger, M. (2008). Strategy as practice? *Strategic Organization*, 6: 83-99.
- Balleisen, E.J. (2001). *Navigating Failure: Bankruptcy and Commercial Society in Antebellum America*. Chapel Hill: University of North Carolina Press.
- Cannon, J.G. (1905). Bank Credits. *Bankers' Magazine*, 70, 586-591.
- Coleman, P.J. (1999). *Debtors and Creditors in America: Insolvency, Imprisonment for Debt, and Bankruptcy, 1607-1900*. Washington, DC: Beard Books.
- Dev, S. (1974). Ratio analysis and the prediction of company failure. In H. Edey & B.S. Yamey (eds.), *Debits, Credits, Finance and Profits*. London: Sweet & Maxwell.
- Espeland, W.N. & Sauder, M. (2007). Rankings and Reactivity: How Public Measures Recreate Social Worlds. *American Journal of Sociology*, 113 (1), 1-40.
- Di Martino, P. (2005). Approaching Disaster: Personal Bankruptcy Legislation in Italy and England, c.1880-1939. *Business History*, 47 (1), 23-43.
- Djelic, M.-L. (2011). When limited liability was (still) an issue – conflicting mobilizations in nineteenth century England. Working paper.
- Earling, P. R. (1890). *Whom to Trust: A Practical Treatise on Mercantile Credits*. Chicago and New York: Rand, McNally and Company.
- Fitzpatrick, P.J. (1931). *Symptoms of Industrial Failures*. Washington: Catholic University of America Press.
- Fitzpatrick, P.J. (1932). *A Comparison of the Ratios of Successful Industrial Enterprises with those of Failed Companies*. The Accountants Publishing Company.
- Foucault, M. (1991). Questions of Method. In G. Burchell, C. Gordon & P. Miller (eds), *The Foucault Effect: Studies in Governmentality*. Hemel Hempstead: Harvester Wheatsheaf.
- Foucault, M. (1970). *The Order of Things: An Archaeology of the Human Sciences*. London: Tavistock Publications.
- Foulke, R.A. (1941). *The Sinews of American Commerce*. New York: Dun & Bradstreet.
- Foulke, R.A. (1945). *Practical Financial Statement Analysis*. New York: McGraw-Hill Book Company, Inc.
- Gilman, S. (1925). *Analyzing Financial Statements*. New York: The Ronald Press Company.
- Hall Williams, J.E. (1970). *The English Penal System in Transition*. London: Butterworths.
- Hirschman, A.O. (1977). *The Passions and the Interests: Political Arguments for Capitalism before its Triumph*. Princeton, NJ: Princeton University Press.
- Horriggan, J.O. (1965). Some Empirical Bases of Financial Ratio Analysis. *The Accounting Review*, 40 (3), 558-568.
- Horriggan, J.O. (1968). A Short History of Financial Ratio Analysis. *The Accounting Review*, 43 (2), 284-294.
- Horriggan, J.O. (1978). *Financial Ratio Analysis: An Historical Perspective*. New York: Arno Press.
- Jeacle, I. & Walsh, E.J. (2002). From moral evaluation to rationalization: accounting and the shifting technologies of credit. *Accounting, Organizations and Society*, 27 (8), 737-761.

- Jones, E. (1981). *Accountancy and the British Economy 1840-1980. The Evolution of Ernst & Whinney*. London: Batsford.
- Justin, W.H. (1924). Operating Control Through Scientific Analysis. *The Journal of Accountancy*, September 1924, 183-95.
- Kurunmäki, L. (1999). Making an accounting entity: the case of the hospital in Finnish health care reforms. *The European Accounting Review*, 8: 219-237.
- Kurunmäki, L. & Miller, P. (2011). *The Failure of a Failure Regime: From Insolvency to De-Authorisation for NHS Foundation Trusts*. CARR Discussion Paper No. 67, 1-35.
- Lester, V.M. (1995). *Victorian Insolvency: Bankruptcy, Imprisonment for Debt, and Company Winding-up in Nineteenth-Century England*. Oxford: Clarendon Press.
- Madison, J.H. (1974). The Evolution of Commercial Credit Reporting Agencies in Nineteenth-Century America. *Business History Review*, 48: 164-186.
- Mann, B.H. (2002). *Republic of Debtors: Bankruptcy in the Age of American Independence*. Cambridge, Mass.: Harvard University Press.
- Matthews, D., Anderson, M. & Edwards, J.R. (1998). *The Priesthood of Industry: The Rise of the Professional Accountant in British Management*. Oxford: Oxford University Press.
- McQueen, R. (2009). *A Social History of Company Law: Great Britain and the Australian Colonies 1854-1920*. Farnham: Ashgate.
- Merwin, C.L. (1942). *Financing Small Corporations in Five Manufacturing Industries, 1926-1936*. New York: National Bureau of Economic Research.
- Meyer, M.W. and Zucker, L.G. (1989). *Permanently Failing Organizations*. Newbury Park, CA: Sage.
- Miller, P. (1994a). Accounting as social and institutional practice: an introduction. In A. G. Hopwood and P. Miller (eds.), *Accounting as Social and Institutional Practice*. Cambridge: Cambridge University Press.
- Miller, P. (1994b). Accounting and Objectivity: The Invention of Calculating Selves and Calculable Spaces. In A. Megill (ed.), *Rethinking Objectivity*. Durham and London: Duke University Press.
- Miller, P. (2001). Governing by numbers: why calculative practices matter. *Social Research*, 68: 379-396.
- Miller, P. and Power, M. (1995). Calculating corporate failure. In Y. Dezalay and D. Sugarman (eds.), *Professional Competition and Professional Power: Lawyers, Accountants and the Social Construction of Markets*. London and New York: Routledge.
- Miller, P. & Rose, N. (1990). Governing economic life. *Economy and Society*, 19: 1-31.
- Moses, D. & Liao, S.S. (1987). On Developing Models for Failure Prediction, *Journal of Commercial Bank Lending*, 69, 27-38.
- Musil, R. (1979). *The Man Without Qualities, Volume One*. London: Pan Books. First published in German, 1930.
- Olegario, R. (2006). *A Culture of Credit: Embedding Trust and Transparency in American Business*. Cambridge, Mass.: Harvard University Press.
- Ohlson, J. (1980). Financial Ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18 (1), 109-131.
- Poon, M. (2007). Scorecards as devices for consumer credit: The case of Fair, Isaac & Company incorporated. In M. Callon, Y. Millo & F. Muniesa (eds.), *Market devices*. Oxford: Blackwell Publishers.
- Poon, M. (2009). From new deal institutions to capital markets: Commercial consumer risk scores and the making of subprime mortgage finance. *Accounting, Organizations and Society*, 34 (5), 654-674.
- Power, M. (1997). *The Audit Society: Rituals of Verification*. Oxford: Oxford University Press.
- Previts, G.J. & Merino, B.D. (1979). *A History of Accounting in America: An Historical Interpretation of the Cultural Significance of Accounting*. New York: Wiley.
- Ramser, J.R. & Foster, L.O. (1931). *A Demonstration of Ratio Analysis*. Bulletin No. 40, Urbana, Ill.: University of Illinois, Bureau of Business Research.
- Sandage, S.A. (2005). *Born Losers: A History of Failure in America*. Cambridge, Mass.: Harvard University Press.
- Skeel, D.A. (2001). *Debt's Dominion: A History of Bankruptcy Law in America*. Princeton, NJ: Princeton University Press.
- Smith, R.F. & Winakor, A.H. (1930). *A Test Analysis of Unsuccessful Industrial Companies*. Bulletin No. 31, Urbana, Ill.: University of Illinois, Bureau of Business Research.

- Smith, R.F. & Winakor, A.H. (1935). *Changes in the Financial Structure of Unsuccessful industrial Corporations*. Bulletin No. 51, Urbana, Ill.: University of Illinois, Bureau of Business Research.
- Strain, M.M. (1929). *Industrial Balance Sheets*. New York: Harper & Bros.
- Tamari, M. (1966). Financial Ratios as a Means of Forecasting Bankruptcy, *Management International Review*, 4, 15-21.
- Wall, A. (1919). Study of Credit Barometrics. *Federal Reserve Bulletin* (March 1st 1919), 229-243.
- Wall, A. & Duning, R.W. (1928). *Ratio Analysis of Financial Statements*. New York: Harper & Brothers.
- Warren, C. (1935). *Bankruptcy in United States History*. Washington, DC: Beard Books.
- Yates, J. (1989). *Control through Communication: The Rise of System in American Management*. Baltimore, Maryland: Johns Hopkins University Press.