



## The performance of insolvency prediction and credit risk models in the UK: A comparative study



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### A B S T R A C T

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Theoretically-driven, market-based contingent claims models have recently been applied to the field of corporate insolvency prediction in an attempt to provide the art with a theoretical methodology that has been lacking in the past. Limited studies have been carried out in order directly to compare the performance of these models with that of their accounting number-based counterparts. We use receiver operating characteristic curves to assess the efficacy of thirteen selected models using, for the first time, post-IFRS UK data; and investigate the distributional properties of model efficacy. We find that the efficacy of the models is generally less than that reported in the prior literature; but that the contingent claims models outperform models which use accounting numbers. We also obtain the counter-intuitive finding that predictions based on a single variable can be as efficient as those which are based on models which are far more complicated – in terms of variable variety and mathematical construction. Finally, we develop and test a naïve version of the down-and-out-call barrier option model for insolvency prediction and find that, despite its simple formulation, it performs favourably compared alongside other contingent claims models.

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## 1. Introduction

The prediction of corporate insolvency and the assessment of credit risk have been the subject of much academic and professional research over the last half century. As when a pebble is thrown into a lake and the shockwaves reach far beyond the point of initial impact, when a company becomes financially distressed/insolvent there are adverse consequences for its diverse stakeholder groups, such as investors, managers, employees, customers and suppliers, which impact onward into other firms, the wider economy and society. According to the president of R3 (the UK association of business recovery professionals), Steven Law (2010), ‘Any future increases in corporate insolvencies are likely to affect others as Insolvency Practitioners estimate that around 27% of corporate insolvencies are triggered by another company’s insolvency – the “domino effect”.’

In a similar vein, a member of the Turnaround Management Association UK asserted in Cooper (2010) that:

‘As business [sic] struggle to survive into 2010, they are likely to put increasing pressure on their suppliers. Payments will be withheld for as long as possible. If and when a company fails, it is likely that the other businesses it owes money

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to will get little or nothing in return. Unfortunately, the knock on effect will be that other firms will also be starved of cash and more will find themselves under financial pressure.'

The area of distress/insolvency prediction is of high economic significance in terms of the number of firms and individuals affected and the implications for investment and lending decision making. Up-to-date research is mandated by the present era of global financial difficulty which follows recent periods of financial sector institutional failure and credit crunch. Fig. 1 shows the number of UK insolvencies annually since 1960. The glut of insolvencies during the economic downturn of the early 1990s is clearly visible, as is a sharp rise in the incidence of insolvencies since 2007.

As regards the prognosis for the incidence of insolvencies in the current period, R3 (2010) had the following sober message:

'We would still expect a spike in the number of insolvencies in the five or six quarters following a recession because many businesses that suffered during the recession find it hard to borrow as lending requirements tighten. Many of them will see "green shoots" but will not be able to fund expansion, especially if interest rates increase. And when a recession ends and assets rise in value, creditors are encouraged to move ahead with more aggressive debt collection.'

This paper evaluates a number of different methods which have been popularly employed in the prior literature to assess firm health together with some more recent approaches. In the current economic climate of global financial turmoil, we seek to assess, using data from recent insolvency cases and post-IFRS implementation, how these various methods and approaches perform for the UK. Whereas many prediction models have shown good *ex post* efficacy in past studies, our findings suggest that many of these models have more modest ability to predict insolvency or financial distress in the current economic downturn. Therefore, extreme care should be taken in relying, wholly or in part, on information obtained from a firm health-determining model for the purposes of financial or economic decision making. UK lending institutions have for some time, like their counterparts around the globe, been urged to re-expand their lending and alleviate the current credit crunch<sup>1</sup>; and under Project Merlin, as announced on 9th February 2011 by George Osborne, UK Chancellor of the Exchequer, the four largest UK lending banks agreed, *inter alia*, to lend £190 billion during 2011 – with the Bank of England to monitor the achievement of lending targets. Our study provides a stark warning to lending institutions seeking to re-expand their lending portfolios as to the technologies they might employ to assess insolvency risk, a key aspect of lending risk. We concur with Abrahams and Zhang (2009), who say:

'A comprehensive new credit risk framework is needed—a hybrid approach that combines the best that technology can offer with expert human judgment. Such an approach can help deal with the current crisis and may lessen the extent of, or even prevent, the next one. The magnitude of the current crisis makes it abundantly clear that there is significant room – and need – for improvement in current credit assessment approaches.'

As part of the assessment undertaken in this paper, we consider whether or not the extensive academic endeavour in this area, with many papers and studies considering, in aggregate, a huge volume of data with diverse techniques and models, has resulted in the academic or practitioner being better able to predict corporate failure now than (s)he would have been, say, 46 years ago after Beaver (1966) published his seminal work on financial ratios and suggested an approach to distinguish between failed and non-failed firms using a single ratio. Beaver himself commented that 'the best single ratio appears to predict about as well as the [early] multi-ratio models' (Beaver, 1966, p. 100); and we are interested, *inter alia*, to see if this is still the case today.

This paper adds to the literature upon the relative efficiency of different models for insolvency prediction in several respects by: (i) using post-IFRS data from the UK; (ii) providing comparisons between broader range of contingent claims and accounting number-based models than are found in earlier extant studies, and using receiver operating characteristic curves as the basis for those comparisons; (iii) proposing and testing a new contingent claims insolvency prediction model; and (iv) investigating the distributional properties of the efficacy of insolvency prediction models.

The paper continues as follows. The next section reviews recent insolvency prediction literature, and the relative popularity of different insolvency prediction technologies used in academic research; the third section describes selection and development of a sample of firms and firm-level data against which to test the different models; the fourth section provides an overview of the methods and models tested within our study; the fifth section describes the means by which we compare the models; and the sixth section presents the results of the comparison. The final section concludes and provides a discussion.

## 2. Review of the prior literature

### 2.1. Evolution and recent developments

The work of Beaver (1966) seeded the modern literature on insolvency prediction with a univariate approach, treated further in Beaver (1968). Methods in the 1970s centred on a multivariate framework, with the widespread use of multivariate

<sup>1</sup> UK Chancellor of the Exchequer, 20th May 2010: 'There is an urgent priority that is getting lending going to small- and medium-sized businesses. That is an absolute urgent priority.' [<http://uk.reuters.com/article/marketsNewsUS/idUKGOVT20MAY20100520>].

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