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Fifty years of research on takeover target prediction: A historical perspective.

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Abstract

Purpose This paper reviews prior studies and presents a synthesis of the takeover prediction literature spanning the period 1968-2018.

Design/methodology/approach The paper adopts a narrative review approach. It explores prior studies on takeover target prediction from a historical perspective, focusing on the evolution and development of the literature over the 50-year period.

Findings From a historical development perspective, prior studies in the area can be partitioned into four distinct eras. Studies in the 1st era (1968-1985) mainly established that takeover targets share common characteristics which can be captured with financial ratios. Studies in the 2nd era (1986-2002) developed and extended formal target prediction hypotheses. These studies concluded that it was impossible to build a successful investment strategy around takeover target prediction. Studies in the 3rd era (2003-2009) explored similar questions using alternative modelling techniques but arrive at similar results—targets can be predicted with limited accuracy and target prediction is unlikely to lead to abnormal returns. Studies in the 4th era (2010-2018) explore implications of M&A predictability on share valuation, governance and bond prices (amongst others), but most importantly, provide some evidence that takeover prediction can lead to abnormal returns when combined with appropriate screening strategies.

Originality/value This presents the first in-depth review of the literature on takeover target prediction. It highlights the development of the literature over four distinct eras and identifies several limitations, research gaps and opportunities for future research. Given the recent decline in the literature (i.e., 4th era), our study may stimulate new research in the area.

Keywords: Literature review, Narrative overview, M&A Targets, Target characteristics, Takeover prediction.

1 Introduction

The prediction of corporate events, a feature of positive accounting theory (Watts and Zimmerman, 1978), is prevalent in the Accounting and Finance literature. Here, prior studies focus on continuous improvement of existing prediction models. For obvious reasons, much of the prediction literature focuses on the prediction of bankrupt firms (Agarwal and Taffler, 2008, 2007; Altman et al., 1968, 1977; Ohlson, 1980; Shumway, 2001; Taffler, 1984, amongst others), with comparatively fewer studies focusing on the prediction of takeover targets (Brar et al., 2009; Danbolt et al., 2016; Palepu, 1986; Powell, 2001; Taussig and Hayes, 1968). Other issues which have also attracted some, albeit very little, interest in the prediction literature include share repurchases (Dittmar, 2000), credit ratings and credit rating changes (Pinches and Mingo, 1973) and loan decisions by loan officers Dietrich and Kaplan (1982); Libby (1975). Several reviews of the bankruptcy prediction literature are easily available (Alaka et al., 2018; Aziz and Dar, 2006; Jones et al., 2017; Kumar and Ravi, 2007), and these are essential for synthesising and consolidating the extensive literature on the subject. To our knowledge, no prior study has synthesised the takeover prediction literature—an issue which this study aims to address.

We explore the development of the takeover prediction literature over the last 50 years (1968-2018) and provide a timely synthesis of the literature. Given the lack of prior reviews on the subject, we adopt a traditional narrative review approach (Green et al., 2006; Hammersley, 2001) that allows us to initiate the process of consolidating the literature. Our review focuses on four key areas; (i) the relevance of takeover prediction modelling, (ii) theoretical underpinnings of takeover likelihood modelling, (iii) the empirical research on takeover prediction; research objectives, key findings and conclusions, and (iv) practitioner perspectives on takeover prediction. Our main findings are briefly highlighted below and discussed in more detail later in our study.

Firstly, our review highlights the relevance of takeover prediction for investors, managers, regulators and research. From an investor perspective, there is potential for target

prediction to form the basis of a successful investment strategy given that significant gains to takeover targets when deals are announced. From the perspective of managers, knowledge of firms' takeover likelihood allows managers to take action to safeguard and protect the interest of their shareholders and other stakeholders (such as employees). For regulators, target prediction provides a useful mechanism for identifying and investigating potential cases of insider trading in takeover targets ahead of the announcement of takeover bids. From a research perspective, the usefulness of accounting information can be directly evaluated based on its ability to predict future events including takeovers. Takeover prediction, therefore, provides a lens through which the value relevance of financial information can be assessed.

Secondly, we explore theoretical perspectives on why certain firms are targeted through takeovers. Here we highlight two main theories; the "market for corporate control theory" and the "misvaluation theory", that have been advanced to underpin target prediction modelling. The market for corporate control theory suggests that the takeover market is an external mechanism for monitoring management action and resolving the agency conflict. The market plays a role in replacing managers who do not maximise shareholder value. The misvaluation theory suggests that the market's inefficiency in the valuation of firms drives takeover activity and the selection of targets. Specifically, bidders seeking to make a quick profit target firms that are relatively undervalued. Several other theoretical perspectives including; agency cost of free cash flow, transaction costs and information asymmetry can be broadly subsumed under this theory.

Thirdly, we provide a narrative overview and map out the historical development of the empirical literature on takeover prediction modelling. From a historical development perspective, prior studies in the area can be partitioned into four distinct eras. Studies in the 1st era (1968-1985) focus on identifying the characteristics of firms that receive takeover bids. These studies do not follow a systematic process for identifying target characteristics (e.g., by drawing from theory) as they mainly adopt data-driven approaches including step-wise variable selection processes. These studies surmise that

takeover targets share common characteristics which can be captured using a variety of financial ratios. Studies in the 2nd era (1986-2002) developed and later extended formal target prediction hypotheses. These hypotheses were motivated by and embedded in theory and form the basis for takeover prediction in contemporary research. However, these studies also conclude that it is impossible to build a successful investment strategy around takeover target prediction. Studies in the 3rd era (2003-2009) explore similar questions using alternative modelling techniques including machine learning approaches, amongst others. Despite the adoption of more "advanced" methodologies and computational techniques, these studies reconfirm the conclusions of studies in the 3rd era—targets can be predicted with limited accuracy and target prediction is unlikely to lead to abnormal returns. Studies in the 4th era (2010-2018) generally explore implications of M&A predictability on share valuation, governance and bond prices (amongst others). These studies, for example, highlight the possibility that takeover likelihood moderates the distribution of wealth between targets and acquirers during takeovers and that takeover risk explains the cross-section of firm returns. More importantly, the studies in this era provide some evidence alluding to the possibility that takeover prediction can lead to abnormal returns when combined with appropriate screening strategies.

Finally, our work explores practitioners' perspectives on takeover prediction by drawing from practitioner publications. We document early instances of takeover prediction by practitioners drawing from the cases of E.H Hutton and Dreyfus Company in 1983. We also discuss the cases of major investment banks (Morgan Stanley and Deutsche Bank) who have made some of their prediction models public. Our evidence suggest that practitioners actively engage in merger target prediction on account of the possibility of developing successful investment strategies around prediction modelling.

Basing on our review, we highlight several opportunities for future research and areas for development of the takeover prediction literature. Our work, therefore, contributes to the extant literature by providing a timely synthesis of the research literature—a useful tool for future researchers— and by identifying areas for future development of the

literature.

The rest of our paper is organised as follows: Section 2 discusses the relevance of takeover prediction modelling. Section 3 explores the main theoretical perspectives around target prediction modelling. Section 4 discusses prior studies on takeover likelihood modelling from a historical perspective based on the year of the journal article publication. Section 5 discusses practitioners' perspectives on takeover prediction by looking at how practitioners have deployed prediction models as a tool for investment decision-making. Concluding remarks are presented in section 6.

2 The relevance of takeover prediction modelling

Corporate events such as takeover and bankruptcy announcements usually result in significant price movements. Indeed, prior M&A research consistently documents significant M&A announcement abnormal returns to targets but insignificant returns to bidders (Andrade et al., 2001; Brooks et al., 2018; Bruner, 2002; Datta et al., 1992; Franks and Harris, 1989; Goergen and Renneboog, 2004; Graham et al., 2002; Jaffe et al., 2015; Jensen and Ruback, 1983; Masulis et al., 2007; Tuch and O'Sullivan, 2007; Wang and Lahr, 2017). These studies suggest that targets gain upwards of 20% abnormal returns when bids are announced. Hence, several target prediction studies are motivated by the possibility of building a successful investment strategy around takeover prediction modelling (Brar et al., 2009; Danbolt et al., 2016; Palepu, 1986; Powell, 2001). As expected there is competition in the prediction market as prior evidence suggests active trading prior to bid announcements. For example, Keown and Pinkerton (1981) find that over half of the abnormal returns that accrue to targets of takeovers are earned prior to the actual announcement day. While this might suggest that investors are better off buying into targets early, targets tend to underperform in the period before they are acquired (Morck et al., 1988), creating a timing risk for investors (Danbolt et al., 2016) and making takeover prediction a non-trivial exercise.

The employment effects of M&A on target managers, as well as, the tendency for target managers to, typically, be ousted during the integration phase of M&A, is well documented (Cannella Jr and Hambrick, 1993; Hambrick and Cannella Jr, 1993; Hartzell et al., 2004). In many circles, a takeover is viewed as a sign of target management inefficiency (Danbolt et al., 2016; Tunyi et al., 2019). Being able to anticipate future takeover bids is therefore important to the management of potential target firms who may want to take action to safeguard the interests of their shareholders or extract excess managerial rent (Ruback, 1987). In contexts wherein the use of some takeover defence strategies is legally appropriate, knowledge of takeover risk can allow managers to set up applicable pre-bid or post-bid takeover defence strategies. These defensive strategies can either make the firm unattractive as a potential target or may even allow target management to generate a higher takeover premium (Holl and Kyriazis, 1997; Klock et al., 2005; Schwert, 2000). Further, knowledge of the likelihood that a firm's competitors and supply chain partners will engage in M&A activity is, perhaps, important for the firm's long term strategy development.

Regulators such as the US Security and Exchange Commission (SEC) and the UK Financial Conduct Authority (FCA), as part of their role, continuously seek to identify insider trading, particularly around M&As. Keown and Pinkerton (1981) note that takeovers are poorly held secrets as the takeover process generally involves several groups and individuals (e.g., investment bankers, advisers, management) all of whom generally hold material price-sensitive information not in the public domain. Events studies on takeovers (Danbolt, 1995; Franks and Harris, 1989; Keown and Pinkerton, 1981, amongst others) show that target share prices start rising up to four months before the bid announcement. Keown and Pinkerton (1981) attribute this growth in prices and the corresponding increase in trading volume to information leakage and insider trading activity. In contrast, Jensen and Ruback (1983) attribute the price run-up to the market's anticipation of imminent bids. Market regulators have a general duty to investigate, on a case by case basis, whether such price run-ups are due to insider trading activity or mar-

ket anticipation. To date, the literature focuses on testing the insider trading hypothesis, perhaps, because market anticipation is non-observable. Prediction modelling potentially provides regulators with a tool to investigate the extent to which some takeover targets could have been anticipated by market participants using only publicly available information. The results from such analyses could inform decisions on whether (or not) to investigate potential cases of market abuse, with important cost implications.

Watts and Zimmerman (1990) argue that the role of positive accounting research is to develop theory that can explain observed phenomena or occurrences. The decision model paradigm (Riahi-Belkaoui, 1996) and the events approach of accounting theory (Sorter, 1969) are both centred on the provision of information about relevant economic events and the development of appropriate models that may be useful in explaining and predicting such events. This is also consistent with (Bartley and Boardman, 1990) contention that the usefulness of accounting information can be directly evaluated by their ability to help investors predict future events such as takeovers. It is within this context that several studies have explored the usefulness of accounting data in explaining future takeovers (Bartley and Boardman, 1986; Walter, 1994).

3 Theoretical underpinnings of takeover likelihood modelling

Two main theoretical perspectives; the "market for corporate control theory" and the "misvaluation theory", have been advanced to underpin target prediction modelling. The market for corporate control theory (Jensen and Ruback, 1983; Manne, 1965) asserts that the market for corporate control is an external mechanism for monitoring management action and resolving the agency conflict. This market (also referred to as the takeover market) is one in which various management teams (i.e., the acquirer and other competing acquirers) compete for the rights to manage a firm's resources Jensen and Ruback (1983); Manne (1965). The theory suggests that managers who perform poorly or take decisions

that do not maximise shareholder wealth are susceptible to takeover bids from competing management teams better able to maximise shareholder wealth. The market for corporate control theory forms the basis for the development of several hypotheses around what drivers takeover likelihood (see, for stance, Danbolt et al., 2016; Palepu, 1986; Powell, 1997). For example, Palepu (1986) puts forward a "management inefficiency hypothesis" which suggests that firm accounting and market under-performance drives takeovers due to competition in the market for corporate control. Manne (1965) contends that the takeover market makes the corporate world a more efficient one by ensuring that managers who deviate from the best interest of their shareholders are replaced by more efficient management teams.

Shleifer and Vishny (2003) and Dong et al. (2006) advance the misvaluation theory which suggests that that the stock market's inefficiency in the valuation of firms has important effects on takeover activity. As suggested by Dong et al. (2006), the effects arise from bidders' deliberate efforts to profit from acquisitions by buying undervalued targets at a price below fundamental value using cash as a method of payment, or by exchanging equity for targets that, even if overvalued, are less overvalued when compared to the bidder. Several studies (Ang and Cheng, 2006; Bi and Gregory, 2011; Dong et al., 2006) investigate how misvaluation (either overvaluation or undervaluation) of both targets and bidders moderates takeover decisions. Consistent with the market for corporate theory (management inefficiency hypothesis), the market's inefficiency in valuing certain firms may arise if managers are ineffective in communicating the value of their firms to investors through their decisions and reporting activity.

Besides the two main theoretical perspectives explaining the choice of merger targets, other studies have advanced agency cost of free cash flow (Jensen, 1986; Powell, 1997), transaction cost (Tunyi, 2019) and information asymmetry (Ambrose and Megginson, 1992a) perspectives which can inform the selection of takeover targets. These perspectives can however be subsumed or deemed as extensions of the market for corporate control theory. For brevity, we do not discuss them further.

4 Empirical studies on takeover likelihood modelling

4.1 Overview of the empirical literature

Given the extensive nature and long history of the research area, a historical perspective is adopted in this review. Here, the studies are discussed based on the era during which they are published. While not clearly distinct from each other, four key eras can be identified. These eras span 1968–1985 (first era), 1986–2002 (second era), 2003–2009 (third era) and 2010-2018 (fourth era). The basis for this classification is the realisation that studies published during each of these four eras share significant similarities in their focus and conclusions.

The studies in the first era generally explore the characteristics or profile of takeover targets and the factors that make certain firms attractive to bidders. The second stream of studies broadly focuses on developing predictive models and employing different empirical techniques to improve the accuracy of target prediction. The third stream generally assesses whether takeover prediction models can be used to generate abnormal returns for investors. The fourth stream of studies considers the implications of takeover target predictability on firm decisions and behaviour. We discuss some of the key studies in the sections that follow.

4.2 Studies in takeover prediction 1968–1985: First era

Several related studies published during this maiden era focused on the characteristics of takeover targets and whether targets could be differentiated from other firms ex-ante. We present a summary of the key studies in Table 1. Taussig and Hayes (1968) appear to be the earliest study on takeover prediction modelling. The study investigates whether firms which failed to provide sufficient information (i.e., choose accounting policies which reduce disclosure) to investors are more likely to be acquired. Using a US sample of 50 targets and 50 non-targets between 1956 and 1967 and conducting a univariate analysis on a set of accounting variables (including inventories to total assets, net fixed assets

to total assets and book value to market value) the study finds that over-conservative accounting policies do not increase a firm's likelihood of being acquired. Instead, poor investment policies (i.e., excess liquid assets), a low return on net worth, and a declining (or unpredictable) dividend pay-out are features of takeover targets (Taussig and Hayes, 1968).

Vance (1969) identifies four variables (including include liquidity, debt position, price-earnings ratio and stability of earnings) that are indicators of a firm's vulnerability to takeovers. The author develops a raider's index based on these variables and suggested that this index could guide management on the likelihood of being the subject of a takeover.

Following on from Vance (1969), Monroe and Simkowitz (1971) seek to improve upon the methodology of earlier studies through their use of stepwise discriminant analysis and a broader set of financial variables. They employ discriminant analysis based on 24 firm financial characteristics on a sample of listed US firms in 1968 to discriminate between future targets and non-targets. The authors observe that future targets and non-targets can be distinguished based on both their financial and non-financial characteristics. They conclude that acquired firms have a lower PE ratio, paid out lower dividends, experienced low growth in equity and are generally smaller in size.

The use of stepwise discriminant analysis by Monroe and Simkowitz (1971) appears to have paved the way for methodological criticisms and development in the research area. Stevens (1973), for example, apply factor analysis—a variable reduction technique which is, perhaps, theoretically more robust than stepwise analysis. By using factor analysis and multiple discriminant analyses, Stevens (1973) finds that future targets and non-target firms can be distinguished from each other based on their financial characteristics. The author employs an equal sample of 40 targets and 40 non-targets from US publicly listed firms in 1966 to show that targets have lower leverage, lower profitability and higher liquidity.

[Insert Table 1 here]

Singh and Singh (1971) is, perhaps, the earliest UK study investigating the unique financial characteristics of UK targets. The researchers employ univariate and discriminant analysis on a sample of 847 UK firms which operated between 1954 and 1960. The study finds that, when compared with non-targets, UK targets have lower profitability, lower growth and lower valuation ratios. Tzoannos and Samuels (1972) build on Singh and Singh (1971) by investigating the differences between the characteristics of targets, bidders and non-merging UK firms using discriminant analysis. The study reveals that UK targets have high levels of capital, experienced a growth in gearing and a decline in profits, have low P/E ratios, low dividend growth rates and were inconsistent in their dividend pay-outs. Bidders, on the other hand, have low levels of capital and reported falling gearing ratios, growing dividends and growing profitability.

Kuehn (1975) extends Tzoannos and Samuels (1972) by employing a longer sample period from 1957 to 1959 and linear probability and probit models to investigate the characteristics of UK targets and bidders. Kuehn (1975) finds that UK targets are characterised by low valuation ratios, profitability ratios, liquidity levels and growth. UK bidders, on the other hand, have high valuation ratios and growth levels but low profitability ratios when compared to their industry average (Kuehn, 1975).

Wansley et al. (1983) do not set out to predict future targets per se, but to investigate whether firms with a high degree of resemblance to acquired firms earn abnormal risk-adjusted returns. This study, perhaps, represents one of the earliest attempts to use takeover likelihood modelling as a portfolio selection tool. Wansley et al. (1983) employ discriminant analysis and a broad set of firm accounting and market variables (including profitability, size, leverage, age, liquidity, price-earnings, stock activity, market valuation, growth, turnover, and dividend policy) to derive models that discriminate between targets and non-target firms. By holding a portfolio of 25 firms with target characteristics, Wansley et al. (1983) show that cumulative abnormal returns of up to 17.1% can be generated over a 21 month holding period (between 1979-1980). Aside from significantly expanding the set of potential discriminatory variables in target prediction

studies, this study was one of the first to highlight the possibility that a portfolio of firms with semblance to merger targets might generate abnormal returns for investors. Other studies in this era looking at characteristics of takeover targets include Canadian studies by Rege (1984) and Belkaoui (1978) and US studies by Dietrich and Sorensen (1984) and Hasbrouck (1985).

4.3 Studies in takeover prediction 1986–2002: Second era

There is a noticeable decline in the number of studies exploring takeover prediction during the 1986–2002 period. This decline can, perhaps, be attributed to the Palepu (1986) study which concluded that, when the empirical analysis is done correctly, takeover prediction, especially for investment purposes, is an unattainable goal. Besides the Palepu (1986) study, several US (see, for example, Ambrose and Megginson, 1992b; Bartley and Boardman, 1986, 1990; Walter, 1994) and UK studies (see, for example, Barnes, 1990, 1999, 2000; Powell, 1997, 2001) were also published during this era. In our search, we did not find any studies published for other regions such as Canada, Australia and the rest of Europe. We present a summary of the papers published during this era in Table 1.

Palepu (1986) is considered a seminal study in the area and has been recurrently cited in contemporary studies. The main contribution of this paper is that it brings to light some methodological biases in earlier (1968–1985) takeover and bankruptcy prediction studies and proposes an improved framework for modelling takeover likelihood. This starts with the development of theoretically grounded prediction hypotheses to guide the selection of predictor variables. Palepu (1986) proposes six hypotheses for takeover prediction (including management inefficiency, growth resource mismatch, industry disturbance, size, market-to-book and price-earnings hypotheses) and three key weaknesses in prior research methodologies (including the use of non-random equal-share samples in model estimation, the use of arbitrary cut-off points in target prediction, and the use of equal-share samples in prediction tests). Palepu (1986) concludes that the model's explanatory power and predictive ability were quite low. This finding was consistent with

the observation that the stock market does not seem to predict targets in advance of takeover announcements (Jensen and Ruback, 1983). Importantly, (Palepu, 1986) concedes that it was impossible to earn significant abnormal returns by investing in predicted acquisition targets.

Ambrose and Megginson (1992b) extend the Palepu (1986) study by exploring the effect of asset structure, institutional shareholdings and takeover defences on takeover likelihood using a sample of 169 targets and 267 non-targets pulled from the period 1979–1986. The study finds that US targets are characterised by a high proportion of fixed or tangible assets within their asset structure. Tangible assets, potentially, proxies for operational synergies between targets and bidders, its availability improves the ease of valuation of potential targets and proxies for asset-rich firms in declining industries (Ambrose and Megginson, 1992b). Additionally, Ambrose and Megginson (1992b) find that the Palepu (1986) prediction model has little explanatory power when re-estimated using their sample as none of the Palepu (1986) hypotheses are validated out-of-sample. The suggestion from the Ambrose and Megginson (1992b) finding is that very little is known about the characteristics of targets.

Other related US studies during this era (Bartley and Boardman, 1986, 1990; Walter, 1994) do not directly focus on takeover prediction for investment purposes. These studies (Bartley and Boardman, 1986, 1990; Walter, 1994) generally use variants of the Palepu (1986) model to evaluate the value-relevance of accounting information. Bartley and Boardman (1986), for example, test whether the ratio of market value to inflation-adjusted book value is better able to classify targets than the ratio of market value to historical book value. The study finds that prediction models with inflation-adjusted financial ratios are better able to classify targets and non-targets when compared to historical cost ratios. Walter (1994) also investigates the usefulness of current costs accounting data (replacement costs) by testing whether target prediction models developed with such accounting data can be useful to investors. Walter (1994) shows that current cost models improve the explanatory power of prediction models. The studies conclude

that inflation-adjusted (Bartley and Boardman, 1986, 1990) and current cost accounting data (Walter, 1994) are more value-relevant to users when compared to historical cost accounting data.

Besides the UK studies published in this era (Barnes, 1990, 1998, 1999, 2000; Powell, 1997, 2001), a few studies look at Greek samples (Slowinski et al., 1997; Zanakis and Zopounidis, 1997). Powell (1997) adopts the hypotheses the Palepu (1986) hypotheses alongside a multinomial framework for takeover prediction based on his contention that hostile and friendly targets have different characteristics. The study contends that the use of a binomial modelling framework (see, for example, Palepu, 1986) is suboptimal and might lead to incorrect conclusions about the factors driving takeovers. Additionally, Powell (1997) finds that the characteristics of targets change over time and prediction models developed based on the Palepu (1986) hypotheses, have a very low explanatory power. Powell (1997) argues that the Palepu (1986) hypotheses which form are basis prediction modelling across many studies either lacked validity or are inadequately captured by empirical proxies. This position is supported by other studies including Barnes (1998) who also find evidence that the use of the Palepu (1986) hypotheses was ineffective in predicting future takeover targets.

Barnes (1990, 1999) extend the work of Palepu (1986) by highlighting other methodological weaknesses of prior research in takeover prediction. Firstly, Barnes (1999) notes that several studies ignore the statistical assumptions that underlie regression estimation procedures such as "multivariate normality" and "equal-group dispersion matrices across all groups". These assumptions are rarely met as financial ratios, which are generally used as predictor variables, are less likely to be normal and more likely to be skewed. Barnes (1999) proposes the use of industry-relative ratios to circumvent this problem. Secondly, Barnes (1999) highlights the issue of model stability over time and across industries if it is going to be of use to investors. Building on Barnes (1999), Barnes (2000) uses a UK sample to test the extent to which targets can be predicted, comparing different models and different variable specifications. Even after including anticipatory share price

changes as a new independent variable, Barnes (2000) finds that none of his models (the industry-specific model or the general model) can correctly predict targets out of sample.

Similar to Powell (1997), Powell (2001) adopts the Palepu (1986) prediction hypotheses to estimate the likelihood of a firm being acquired. Powell (2001) extends Powell (1997) by also testing whether abnormal returns can be generated by holding a portfolio of firms predicted as potential targets by the model. The study proposes an alternative strategy for determining optimal out-of-sample cut-off probabilities which takes into account the investment objective of prediction modelling. The Powell (2001) classification rule, when applied to the holdout samples, results in smaller predicted samples with higher takeover probabilities compared to the Palepu (1986) procedure.

In the empirical part of the analysis, Powell (2001) employs an equal-share UK sample of 471 targets and 471 non-targets to develop his model. The model is tested out-of-sample by using fresh data from 1996. The model predicts that 216 firms will receive a bid in the next period, of which only 7 (or 3.24%) of these firms received such a bid. The next stage in the study involves holding a portfolio of all predicted targets over the one year period. Powell (2001) finds that, despite the methodological improvements introduced in the study, the portfolio of predicted targets generated significantly negative abnormal returns during the holding period.

4.4 Studies in takeover prediction 2003-2009: Third era

The second era (1986–2002) is marked by a general contention that it is difficult, if not impossible, for takeover prediction to form the basis of a successful investment strategy. The primary reason advanced for this is that target prediction models are inefficient as high levels of prediction errors are recorded (Palepu, 1986; Powell, 2001). This, perhaps, explains why many studies post-2002, focus on the use of new computational techniques to improve prior takeover prediction models (Espahbodi and Espahbodi, 2003; Powell, 2004; Powell and Yawson, 2007).

Espahbodi and Espahbodi (2003) employs both non-parametric (recursive partitioning) and parametric tests (discriminant, logit and probit models) along-side the Palepu (1986) state-based sampling methodology to develop takeover prediction models for US targets. Aside from using financial variables similar to those in Palepu (1986), Espahbodi and Espahbodi (2003) investigate the predictive potential of several non-financial variables such as anti-takeover regulation, the presence of poison pills defensive strategies, the presence of golden parachutes, directors' ownership within the company. Using a stepwise elimination procedure, the study identifies the optimal predictor variables as free cash flow to total assets, golden parachute dummy, Delaware dummy and equity market value to total firm-value. Espahbodi and Espahbodi (2003), however, find that their models poorly predicted future targets.

Powell (2004) builds on Powell (1997) which proposes a multinomial framework for predicting takeover targets—a framework which differentiates between friendly and hostile targets. Powell (2004) argues that the characteristics of hostile takeover targets are markedly different from those of friendly takeover targets given the fact that the motive for hostile takeovers is to enforce discipline while that of friendly takeovers is to achieve synergies. Powell (2004) contends that a multinomial framework (as opposed to a simple binomial framework) that takes into account the characteristics of the event (hostile or friendly) should result in models with more explanatory power and hence, better predictive abilities. Powell (2004) hypothesises that friendly targets are more likely to be small firms in financial distress, having low levels of liquidity and high leverage while hostile targets are more likely to be profitable firms.

Powell (2004) employs a UK sample consisting of an estimation sample of 9,891 firm-years drawn from 1986 to 1995 and a holdout sample of 1,000 firm-years drawn from 1996. The study reports poor model predictive ability as all models (multinomial and binomial) misclassified a large number of non-targets as targets and no model achieves a better-than-chance predictive ability. Aside from a significant difference in the size of friendly and hostile targets, the results from the model do not lend support to the contention

that friendly and hostile targets have substantial differences. The theorised benefits of a multinomial modelling framework are not, therefore, empirically confirmed in this study. Further, the number of hostile targets in the sample is, perhaps, too few (zero in some years) for a multinomial model to be of any substantial benefit. This relative scarcity in the number of hostile targets limits further research on this issue.

Powell and Yawson (2007) focus on factors driving restructuring events. The study investigates whether the variables frequently used in takeover prediction (Ambrose and Megginson, 1992b; Palepu, 1986; Powell, 2001) also explain other restructuring events such as layoffs, bankruptcies and divestitures. Powell and Yawson (2007) employ a sample of 482 takeovers, 82 bankruptcies, 360 divestitures and 631 layoffs in UK firms between 1992 and 2002. During this period there were no restructuring events in 8,048 firm-year observations. Using a multinomial model, Powell and Yawson (2007) find evidence that takeover targets, firms involved in divestitures and bankrupt firms are all characterised by declining stock returns. The results from the analysis reveal that the variables frequently used in takeover prediction also explain divestitures, layoffs and bankruptcies. This suggests that the set of prediction hypotheses used across prior studies in takeover prediction (Ambrose and Megginson, 1992b; Palepu, 1986; Powell, 2001) does not comprehensively capture the unique strategic motives of takeovers.

Ouzounis et al. (2009) employ a UK sample of 416 takeover targets and 1,160 non-targets between 2001 and 2005 to explore the characteristics of targets. The study finds that targets are significantly larger, potentially undervalued and less profitable when compared to non-targets. The finding on firm size is consistent with Powell and Yawson (2007) but in contrast to evidence which suggests that targets are, on average, smaller than non-targets (see, for example, Palepu, 1986; Powell, 2004, 2001; Walter, 1994). The finding that targets have more inefficient management teams and are generally undervalued corroborates earlier research findings (see, for example, Palepu, 1986; Powell, 2001; Walter, 1994).

Several studies explore the performance of non-parametric techniques for prediction.

Ouzounis et al. (2009) explore the performance of other non-parametric methods such as Utilités Additives Discriminantes (UTADIS), Artificial Neural Networks (ANN) and Support Vector Machines (SVM). Other UK studies such as Pasiouras and Tanna (2010); Pasiouras et al. (2007) have also explored the use of non-parametric models including Multi-group Hierarchical Discrimination Method (MHDIS) and UTADIS in the prediction of UK targets. The objective of these studies is generally to compare the discriminatory ability of these new techniques and not to predict future targets per se. These studies generally find limited evidence that the more sophisticated non-parametric methodologies consistently outperform a simple discriminant analysis model.

Outside the US and US, a few studies during this era explore takeover prediction using EU samples. While some researchers have employed a European Union-wide approach (Brar et al., 2009), others focus on a single European country (Tsagkanos et al., 2007). In a cross-country European study, Brar et al. (2009) posit that the takeover prediction models that incorporate share price momentum and trading volume can generate abnormal returns. The study employs the Palepu (1986) hypotheses together with the state-based sampling methodology (Palepu, 1986). Brar et al. (2009) report that European targets were smaller than non-targets, undervalued, with low liquidity and low sales growth. European targets were also found to exhibit strong short-term price momentum and their shares are actively traded prior to takeover announcements (Brar et al., 2009). Controversially, Brar et al. (2009) conclude that it was possible to generate significant abnormal returns by investing in predicted targets. Their results are, however, prone to look-ahead-bias as their model is tested on the same sample used to develop model parameters.

Tsagkanos et al. (2007), on the other hand, focus on a single EU country by developing a target prediction model for Greece. The study employs a set of variables which presumably have unique influences in the Greek economy and a strategic bearing on the decision to acquire Greek firms. Tsagkanos et al. (2007) find that Greek targets are generally larger, with high productivity, accumulated experience and good financial per-

formance. While the study only focuses on a small economy, it highlights the importance of country or context on the choice of prediction variables. It also shows that the relationship between takeover probability and firm variables (e.g., firm size) is likely to be context-dependent.

4.5 Studies in takeover prediction 2010-2018: Fourth era

There is a significant decline in the number of papers exploring issues around takeover prediction post-2009. While one of the studies in this era focuses on exploring characteristics of IPO firms that quickly become targets (De and Jindra, 2012), and the other (Rodrigues and Stevenson, 2013) alternative empirical strategies for improving prediction model performance, the main studies in this era (including Bhanot et al. (2010); Cornett et al. (2011); Cremers et al. (2009)) employ takeover probabilities as a key input variable to investigate different research questions. Cremers et al. (2009), for example, develop a model to predict takeover targets, with the objective of testing the impact of takeover likelihood on firm valuation i.e., whether takeover likelihood is reflected in share prices. In the study, the takeover likelihood is defined as a probit function of a firm's Q ratio, tangible assets, cash resources, blockholders' dummy, size, industry leverage and return on assets. Cremers et al. (2009) find that portfolios based on a takeover factor generate annualised mean abnormal returns of up to 7.95%. Nonetheless, these returns are not explained by the targets in the sample as the returns persist (at a similar magnitude) when actual targets are excluded from the sample. The study concludes that a takeover factor (derived from firm takeover likelihood) partly explains the cross-section of firm returns.

Bhanot et al. (2010) investigate the effect of a firm's takeover risk on the relationship between its stock returns and bond prices. The authors defined takeover risk as a function of firm size, market to book ratio, excess returns, EBITDA, R&D, level of tangible property, leverage, percentage of institutional ownership and one-year price volatility. Only completed takeovers are considered and a probit regression model is used to obtain

the takeover probability. No validation tests are conducted to ascertain the validity of the model in computing firm takeover probability. Bhanot et al. (2010) find that takeover risk explains the correlation between stock returns and bond prices.

Cornett et al. (2011) investigate investors' anticipation of bidder and target candidacy in takeovers and whether this anticipation moderates the wealth distribution between bidders and targets in takeovers. In the research design, bid probability or risk of takeover for targets is used to develop a measure of market anticipation. Cornett et al. (2011) model bid probability as a logit function of sales shock, size, change in size, industry concentration, growth-resource mismatch, return on assets, cash ratio, price run-up, information asymmetry and participation in previous mergers. Similar to Cremers et al. (2009) and Bhanot et al. (2010), Cornett et al. (2011) do not explore the validity of their prediction model. Cornett et al. (2011) conclude that differences in investor anticipation of merger candidates explain the differences in returns to acquirers and targets.

The validity of the latter studies (Bhanot et al., 2010; Cornett et al., 2011; Cremers et al., 2009) is, perhaps, reliant on their models' efficiency in measuring takeover risk. These three studies do not, however, test whether the models can predict future targets. Further, the variables used in the definition of takeover risk in these three studies are a mix of the variables that have recurrently been used and criticised (for lacking explanatory power) in prior empirical research. Perhaps, the true test of a prediction model or one that measures takeover risk is not whether it generates abnormal returns (Cremers et al., 2009) but whether it can predict the event in question (future targets or bidders). It is unclear whether a more optimal takeover risk model will alter the conclusions of these studies.

A recent study by Danbolt et al. (2016) re-examines whether portfolios of predicted targets can form the basis of a profitable investment strategy. The study argues that portfolios of predicted targets systematically underperform for the following three reasons.

- Prediction errors; Several non-targets are identified as potential targets thus diluting portfolio returns.

- Poor timing; Prediction models select targets either too early thus picking up target pre-bid underperformance or too late thus missing the announcement day returns.
- Misclassification of distressed/bankrupt firms as potential targets; Distressed and target firms share several characteristics (Powell and Yawson, 2007) but distressed firms earn -100% returns as hence, dilute returns to predicted target portfolios.

While the prediction errors and poor timing are challenging to address, Danbolt et al. (2016) suggest a simple screening strategy for addressing the misclassification problem. The study finds that significant abnormal returns can be earned from target portfolios screened for size, leverage and liquidity—characteristics which differentiate distressed firms from takeover targets.

5 Practitioner perspectives on takeover prediction

Given the practical implication of takeover prediction and the potential usefulness to investors such as fund managers, it is not surprising that practitioners have also been involved in takeover predictions as a basis for investment strategies. Wansley et al. (1983) highlight two early cases of investment firms (E.H Hutton and Dreyfus Company) with investment strategies centred on investing in potential takeover targets. Wansley et al. (1983) note that E.H Hutton regularly published its "Acquisition Candidates" brochure devoted to identifying stocks with a high probability of being acquired. The Dreyfus Company also managed a Merger and Acquisition Fund with the goal of investing in firms which are likely acquisition targets (Wansley et al., 1983). While several investment firms claim to employ target prediction models as the basis of their investment strategies, the models employed by these firms are proprietary and hence not disclosed. Interestingly, Morgan Stanley IQ and strategists at Deutsche Bank have published the takeover prediction models these firms employ as part of their investment strategies. This published material can therefore provide some useful insights into the practitioners' approach to takeover prediction modelling as an investment strategy. The approaches used

by these institutions are discussed below.

Morgan Stanley runs a Target Equity Index Family (TEIF) as part of its Intelligent Investing programme (Morgan Stanley IQ, 2008, 2013). This family is a group of five funds made up of a World Target Equity Index, a Europe Target Equity Index, a US Target Equity Index, a UK Target Equity Index and a Japan Target Equity Index. The objective of the Target Equity Index Family was to select undervalued stocks that may be potential takeover targets (Morgan Stanley IQ, 2008). What is intriguing about the prediction of potential targets by Morgan Stanley is the simplicity of the model/methodology employed. The firm indicates that the TEIF, "...uses a screening process that is quantitative, rules-based and transparent. It ranks and selects stocks using inputs from publicly available firm data to create a series of global, regional and country indices" (Morgan Stanley IQ, 2008, p.2). The firm simply ranks stocks based on five financial characteristics (including the ratio of free cash flow to enterprise value, interest cover, dividend yield, the ratio of enterprise value to fixed assets and the ratio of share price to book value then selects the 50 stocks with the best ranking across all variables to form the target equity index.

Based on self-reported performance in "back-tests" between April 2001 and July 2007 Morgan Stanley IQ (2013), the UK (or world) Target Equity Index generated a total annualised return of 14.40% (or 17.10%) while a broad-based index such as the Morgan Stanley Capital Index (MSCI) UK (or world) generated an annualised return of 6.40% (or 0.5%) during the same period. This leads to an excess return of 8.10% (UK) or 16.60% (world). In "live tests", Morgan Stanley IQ (2013) reports that the target equity index did not out-performed the MSCI between July 2007 and April 2013. The Morgan Stanley World Target Equity earned an annualised return of –1.5% as against the –0.9% annualised return earned by the MSCI world index. The results show that on a risk-adjusted basis, the model does not generate returns higher than those of the market. In fact, the strategy underperforms the market.

The Cahan et al. (2011) paper is developed by five quantitative strategists working

at Deutsche Bank. To develop their prediction models, the strategists employ the variables used in Brar et al. (2009) together with informed trading, high-frequency trading and technical trading variables. These variables attempt to capture the sentiments of other market participants (such as option traders, technical traders and high-frequency traders) by examining the minute-to-minute movements in stock prices. By employing a logit regression model on the sample of Russell 3000 stocks, the strategists find that targets have a higher price to earnings, lower price to book, higher gearing, good gross margins, are within active M&A sectors, have lower trading volume, lower market capitalisation, higher total assets, lower price volatility, fat tails in daily returns, higher option trading volume and positive intraday return skewness. Cahan et al. (2011), on average, achieve a target concentration of just 0.8% (worse the random prediction) using their high-frequency model which predicts targets on a monthly basis. When its abnormal returns are considered, the model substantially underperforms the market in all periods between June 2001 and June 2011.

6 Concluding remarks

6.1 Summary of main findings

This study synthesises and consolidates 50 years of research on takeover target prediction. We achieve this by exploring (i) the motivations for or relevance of takeover prediction modelling, (ii) the objectives, key findings and conclusions from prior empirical research on takeover prediction and (iii) the perspectives of practitioners engaged in target prediction for investment strategy purposes.

In terms of the relevance of takeover prediction modelling, we document the importance of takeover prediction for investors, management, and regulators. Specifically, we highlight (i) the potential for investors to generate abnormal returns by investing in portfolios of predicted targets, (ii) the need for managers to be aware of their firms' risk of becoming the subject of a takeover bid, and (iii) the potential for target prediction

models to aid regulators in their bid to narrow down potential cases of insider trading ahead of takeover announcements.

We identify four distinct eras (1968–1985, 1986–2002, 2003–2009 and 2010–2018) in the empirical research on takeover prediction and document the development of the literature across these four eras. The first era is characterised by the finding that target selection is non-random and targets share some discernable characteristics. Irrespective of context (US, UK, Canada), most of the studies seem to agree that targets are characterised by low valuation ratios (i.e., targets are potentially undervalued firms), unstable or falling dividends and low profitability ratios (i.e., targets are, on average, poorly performing firms). The studies also establish that financial and market variables can act as reasonable proxies for the motives of takeovers. Besides significant methodological weaknesses, these studies fail to provide a theoretical framework underlying the selection of variables in the models. The studies neither discuss the choice of discriminatory variables nor hypothesise on the relationship between variables and takeover likelihood.

The second era is marked by the Palepu (1986) which has formed the cornerstone of takeover prediction to date. The study introduced a theoretical framework for selection predictor variables, as well as, an improved methodology for takeover prediction. Other studies during the era contribute by further developing new hypotheses (Ambrose and Megginson, 1992b; Powell, 1997) and by extending the Palepu (1986) methodology (see, for example, Barnes, 1999; Powell, 2001). Most studies during this era concluded that portfolios of predicted are unlikely to generate abnormal returns (Barnes, 2000; Palepu, 1986; Powell, 1997, 2001). Importantly, several studies in this era (see, for example, Ambrose and Megginson, 1992b; Barnes, 2000; Powell, 1997, 2001) highlight the lack of comprehensiveness, sufficiency and validity of the Palepu (1986) hypotheses and prediction variables.

The third era is characterised by a general shift in research focus from developing predictive variables/hypotheses (i.e., understanding the factors that drive takeovers) towards an agenda of testing the ability of different empirical and computational techniques

(parametric and non-parametric discriminatory models) to predict future targets. The studies in this era (see, for example, Espahbodi and Espahbodi, 2003; Ouzounis et al., 2009; Pasiouras and Tanna, 2010; Pasiouras et al., 2007; Powell, 2004; Powell and Yawson, 2007) implicitly assume that the Palepu (1986) hypotheses fully explain the underlying rationales for takeover. This, perhaps, explains why most of the studies adopt the Palepu (1986) hypotheses but try to improve upon his computational model (logit) by employing multinomial models and non-parametric models. The results derived from the different parametric and non-parametric models employed in many of the studies indicate that these new computational techniques do not, in many cases, improve the accuracy of takeover prediction models. Generally, the models correctly predict very few targets and in so doing misclassify very many non-targets as targets. The effect is that the promised returns to takeover prediction have not been achieved, unless when substantial bias is incorporated in the study.

The studies in the fourth era build on existing target prediction models. The studies examined (Bhanot et al., 2010; Cornett et al., 2011; Cremers et al., 2009) do not explicitly recognise the limitations of existing models—particularly, the recurrent finding that these models are unable to correctly predict targets out-of-sample and hence, have low explanatory power. While these studies have broken new ground by exploring how takeover likelihood influences stock and bond valuation, as well as, the wealth distribution between acquirers and targets during M&As, the question of the appropriateness of these models is yet to be addressed. The Danbolt et al. (2016) study, partly, explains why target portfolios systematically underperform but did not address the fundamental issue of low out-of-sample predictive ability of these models.

There is evidence that practitioners are involved in prediction modelling. The models employed by practitioners range from simple ranking strategies (Morgan Stanley IQ, 2008, 2013) to models which incorporate high-frequency data (Cahan et al., 2011). The conclusions from practitioner research are generally consistent with the evidence from academic research—portfolios of predicted targets do not generate abnormal returns.

Overall, practitioner models neither have a superior predictive ability nor a superior ability to generate above-normal returns for investors.

6.2 Areas for future research

As is evidenced by this narrative review, after 50 years of research on the subject, it appears little is known about the factors that drive the selection of takeover targets. Results appear to be vastly different across studies depending on chosen samples, time periods, variables and empirical proxies, methodological choices for modelling, strategies for out-of-sample identification or selection of prospective targets and alternative frameworks for testing model performance. Perhaps, the shift towards the application of more advanced and non-parametric models (as evident in the third era) is pre-mature as a solid foundation for prediction modelling is yet to be laid. For example, evidence from Ambrose and Megginson (1992b) and Powell and Yawson (2007) suggest that the Palepu (1986) hypotheses do not explain the strategic rationale for takeovers. A potential way forward is for researchers in the area to revisit the development of predictive hypotheses as knowledge about what motivations/factors drive takeovers is still incomplete. Some recent studies (Tunyi, 2019; Tunyi et al., 2019) have started to explore these issues. To facilitate this process, a systematic review which identifies the key themes and discusses in the literature is likely to pave the way for further studies.

It is unclear whether target characteristics and hence, prediction models, are stable over time and across contexts. In the area of bankruptcy prediction, as well as other areas such as the modelling of financial constraints, coefficients developed several decades ago (see, for example, Altman et al., 1968; Kaplan and Zingales, 1997; Taffler, 1984; Whited and Wu, 2006) are readily used by contemporary researchers to compute variables such as bankruptcy risk (e.g., Altman Zeta, Taffler Z score) and the level of financial constraints (e.g., KZ-index, WW-index). Due to the level of complexity involved in modelling takeover likelihood, future researchers are likely to benefit from established empirical models for quickly computing firms' takeover likelihood which are similar to

existing models for computing bankruptcy risk.

Recent studies such as Danbolt et al. (2016) have suggested strategies for improving prediction models and enhancing portfolio returns. There is the need for these strategies to be tested across different contexts and time periods. In this regard, with the exception of Tunyi and Ntim (2016) which explores antecedents of takeovers in an African context, there is a dearth of research exploring takeover prediction beyond the Western world.

Our review of the takeover prediction literature focuses on the prediction of targets. It is worth noting that a few studies have attempted to develop models to predict acquirers (Cornett et al., 2011; Tunyi, 2020). There are therefore opportunities to develop integrated frameworks for matching acquirers and targets. This will be facilitated by further studies exploring the profile of acquirers.

Finally, most target prediction studies explore portfolio performance without taking into consideration some of the practical challenges of portfolio investment. For example, the studies do not consider restrictions on portfolio sizes (e.g., small investors who constitute a substantial proportion of investors hold small portfolios) or the implications of transaction costs. Several studies employ large portfolios with significant portfolio turnover and hence, round-trip costs. In addition, some studies apply hedge strategies which substantially increases these transaction costs. These costs can severely limit the profitability of portfolio strategies but have been ignored by prior research. Future studies can therefore explore how portfolio size and transaction costs influence the profitability of target prediction strategies.

References

Agarwal, V. and Taffler, R. (2008). Comparing the performance of market-based and accounting-based bankruptcy prediction models. *Journal of Banking & Finance*, 32(8):1541–1551.

Agarwal, V. and Taffler, R. J. (2007). Twenty-five years of the taffler z-score model: Does it really have predictive ability? *Accounting and Business Research*, 37(4):285–300.

Alaka, H. A., Oyedele, L. O., Owolabi, H. A., Kumar, V., Ajayi, S. O., Akinade, O. O., and Bilal, M. (2018). Systematic review of bankruptcy prediction models: Towards a framework for tool selection. *Expert Systems with Applications*, 94:164–184.

Altman, E. I. et al. (1968). The prediction of corporate bankruptcy: A discriminant analysis. *Journal of Finance*, 23(1):193–194.

Altman, E. I., Haldeman, R. G., and Narayanan, P. (1977). Zetatm analysis a new model to identify bankruptcy risk of corporations. *Journal of banking & finance*, 1(1):29–54.

Ambrose, B. and Megginson, W. L. (1992a). The role of asset structure, ownership structure, and takeover defenses in determining acquisition likelihood. *Journal of Financial and Quantitative Analysis*, 27(04):575–589.

Ambrose, B. W. and Megginson, W. L. (1992b). The role of asset structure, ownership structure, and takeover defenses in determining acquisition likelihood. *Journal of Financial and Quantitative Analysis*, 27(4):575–589.

Andrade, G., Mitchell, M., and Stafford, E. (2001). New evidence and perspectives on mergers. *Journal of Economic Perspectives*, 15(2):103–120.

Ang, J. S. and Cheng, Y. (2006). Direct evidence on the market-driven acquisition theory. *Journal of Financial Research*, 29(2):199–216.

Aziz, M. A. and Dar, H. A. (2006). Predicting corporate bankruptcy: where we stand? *Corporate Governance: The international journal of business in society.*

Barnes, P. (1990). The prediction of takeover targets in the u.k. by means of multiple discriminant analysis. *Journal of Business Finance & Accounting*, 17(1):73–84.

Barnes, P. (1998). Can takeover targets be identified by statistical techniques?: Some uk evidence. *Journal of the Royal Statistical Society: Series D (The Statistician)*, 47(4):573–591.

Barnes, P. (1999). Predicting uk takeover targets: Some methodological issues and an empirical study. *Review of Quantitative Finance and Accounting*, 12(3):283–302.

Barnes, P. (2000). The identification of uk takeover targets using published historical cost accounting data some empirical evidence comparing logit with linear discriminant analysis and raw financial ratios with industry-relative ratios. *International Review of Financial Analysis*, 9(2):147–162.

Bartley, J. W. and Boardman, C. M. (1986). Replacement-cost-adjusted valuation ratio as a discriminator among takeover target and nontarget firms. *Journal of Economics and Business*, 38(1):41–55.

Bartley, J. W. and Boardman, C. M. (1990). The relevance of inflation adjusted accounting data to the prediction of corporate takeovers. *Journal of Business Finance & Accounting*, 17(1):53–72.

Belkaoui, A. (1978). Financial ratios as predictors of canadian takeovers. *Journal of Business Finance & Accounting*, 5(1):93–107.

Bhanot, K., Mansi, S. A., and Wald, J. K. (2010). Takeover risk and the correlation between stocks and bonds. *Journal of Empirical Finance*, 17(3):381–393.

Bi, X. G. and Gregory, A. (2011). Stock market driven acquisitions versus the q theory of takeovers: The uk evidence. *Journal of Business Finance & Accounting*, 38(5-6):628–656.

Brar, G., Giamouridis, D., and Liodakis, M. (2009). Predicting european takeover targets. *European Financial Management*, 15(2):430–450.

Brooks, C., Chen, Z., and Zeng, Y. (2018). Institutional cross-ownership and corporate strategy: The case of mergers and acquisitions. *Journal of Corporate Finance*, 48:187–216.

Bruner, R. F. (2002). Does M&A pay? A survey of evidence for the decision-maker. *Journal of Applied Finance*, 12(1):48–68.

Cahan, R., Luo, F., Alvarez, M., Jussa, J., and Chen, Z. (2011). Signal processing; targeting takeovers'. *Deutsche Bank Quantitative Strategy, Deutsche Bank Securities Inc*, 22.

Cannella Jr, A. A. and Hambrick, D. C. (1993). Effects of executive departures on the performance of acquired firms. *Strategic Management Journal*, 14(S1):137–152.

Cornett, M. M., Tanyeri, B., and Tehranian, H. (2011). The effect of merger anticipation on bidder and target firm announcement period returns. *Journal of Corporate Finance*,

17(3):595–611.

Cremers, K. M., Nair, V. B., and John, K. (2009). Takeovers and the cross-section of returns. *The Review of Financial Studies*, 22(4):1409–1445.

Danbolt, J. (1995). An analysis of gains and losses to shareholders of foreign bidding companies engaged in cross-border acquisitions into the united kingdom, 1986–1991. *The European Journal of Finance*, 1(3):279–309.

Danbolt, J., Siganos, A., and Tunyi, A. (2016). Abnormal returns from takeover prediction modelling: challenges and suggested investment strategies. *Journal of Business Finance & Accounting*, 43(1-2):66–97.

Datta, D. K., Pinches, G. E., and Narayanan, V. K. (1992). Factors influencing wealth creation from mergers and acquisitions: A meta-analysis. *Strategic Management Journal*, 13(1):67–84.

De, S. and Jindra, J. (2012). Why newly listed firms become acquisition targets. *Journal of Banking & Finance*, 36(9):2616–2631.

Dietrich, J. K. and Sorensen, E. (1984). An application of logit analysis to prediction of merger targets. *Journal of Business Research*, 12(3):393–402.

Dietrich, J. R. and Kaplan, R. S. (1982). Empirical analysis of the commercial loan classification decision. *Accounting Review*, pages 18–38.

Dittmar, A. K. (2000). Why do firms repurchase stock. *The Journal of Business*, 73(3):331–355.

Dong, M., Hirshleifer, D., Richardson, S., and Teoh, S. H. (2006). Does investor misvaluation drive the takeover market? *The Journal of Finance*, 61(2):725–762.

Espahbodi, H. and Espahbodi, P. (2003). Binary choice models and corporate takeover. *Journal of Banking & Finance*, 27(4):549–574.

Franks, J. R. and Harris, R. S. (1989). Shareholder wealth effects of corporate takeovers: The u.k. experience 1955–1985. *Journal of Financial Economics*, 23(2):225–249.

Goergen, M. and Renneboog, L. (2004). Shareholder wealth effects of european domestic and cross-border takeover bids. *European Financial Management*, 10(1):9–45.

Graham, J. R., Lemmon, M. L., and Wolf, J. G. (2002). Does corporate diversification destroy value? *The Journal of Finance*, 57(2):695–720.

Green, B. N., Johnson, C. D., and Adams, A. (2006). Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *Journal of chiropractic medicine*, 5(3):101–117.

Hambrick, D. C. and Cannella Jr, A. A. (1993). Relative standing: A framework for understanding departures of acquired executives. *Academy of Management journal*, 36(4):733–762.

Hammersley, M. (2001). On'systematic'reviews of research literatures: a'narrative'response to evans & benefield. *British educational research journal*, 27(5):543–554.

Hartzell, J. C., Ofek, E., and Yermack, D. (2004). What's in it for me? ceos whose firms are acquired. *The Review of Financial Studies*, 17(1):37–61.

Hasbrouck, J. (1985). The characteristics of takeover targets q and other measures. *Journal of Banking & Finance*, 9(3):351–362.

Holl, P. and Kyriazis, D. (1997). Wealth creation and bid resistance in uk takeover bids. *Strategic Management Journal*, 18(6):483–498.

Jaffe, J., Jindra, J., Pedersen, D., and Voetmann, T. (2015). Returns to acquirers of public and subsidiary targets. *Journal of Corporate Finance*, 31:246–270.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, 76(2):323–329.

Jensen, M. C. and Ruback, R. S. (1983). The market for corporate control: The scientific evidence. *Journal of Financial Economics*, 11(1):5–50.

Jones, S., Johnstone, D., and Wilson, R. (2017). Predicting corporate bankruptcy: An evaluation of alternative statistical frameworks. *Journal of Business Finance & Accounting*, 44(1-2):3–34.

Kaplan, S. N. and Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *The quarterly journal of economics*, 112(1):169–215.

Keown, A. J. and Pinkerton, J. M. (1981). Merger announcements and insider trading activity: An empirical investigation. *The journal of finance*, 36(4):855–869.

Klock, M. S., Mansi, S. A., and Maxwell, W. F. (2005). Does corporate governance matter to bondholders? *Journal of financial and quantitative analysis*, 40(4):693–719.

Kuehn, D. (1975). *Takeovers and the Theory of the Firm: an empirical analysis for the United Kingdom 1957–1969*. Springer.

Kumar, P. R. and Ravi, V. (2007). Bankruptcy prediction in banks and firms via statistical and intelligent techniques–a review. *European journal of operational research*, 180(1):1–28.

Libby, R. (1975). Accounting ratios and the prediction of failure: Some behavioral evidence.

Journal of Accounting Research, pages 150–161.

Manne, H. G. (1965). Mergers and the market for corporate control. *Journal of Political Economy*, 73.

Masulis, R. W., Wang, C., and Xie, F. E. I. (2007). Corporate governance and acquirer returns. *The Journal of Finance*, 62(4):1851–1889.

Monroe, R. J. and Simkowitz, M. A. (1971). Investment characteristics of conglomerate targets: a discriminant analysis. *Southern Journal of Business*, 9:1–16.

Morck, R., Shleifer, A., and Vishny, R. W. (1988). Management ownership and market valuation: An empirical analysis. *Journal of financial economics*, 20:293–315.

Morgan Stanley IQ (2008). Morgan stanley world target equity index. http://www.morganstanleyiq.ch/pdf/EN/brochure/brochureXS0461814096.pdf. Accessed: 2020-08-29.

Morgan Stanley IQ (2013). Morgan stanley world target equity index (eur, pr). https://internal.morganstanleyiq.com/pdf/underlying/factsheet/EN/factsheetMSIQWTEP%20Index.pdf. Accessed: 2020-08-29.

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of accounting research*, pages 109–131.

Ouzounis, G., Gaganis, C., and Zopounidis, C. (2009). Prediction of acquisitions and portfolio returns. *International Journal of Banking, Accounting and Finance*, 1(4):381–406.

Palepu, K. G. (1986). Predicting takeover targets: A methodological and empirical analysis. *Journal of Accounting and Economics*, 8(1):3–35.

Pasiouras, F. and Tanna, S. (2010). The prediction of bank acquisition targets with discriminant and logit analyses: Methodological issues and empirical evidence. *Research in International Business and Finance*, 24(1):39–61.

Pasiouras, F., Tanna, S., and Zopounidis, C. (2007). The identification of acquisition targets in the eu banking industry: An application of multicriteria approaches. *International Review of Financial Analysis*, 16(3):262–281.

Pinches, G. E. and Mingo, K. A. (1973). A multivariate analysis of industrial bond ratings. *The journal of Finance*, 28(1):1–18.

Powell, R. (2004). Takeover prediction models and portfolio strategies: a multinomial approach.

Multinational Finance Journal, 8(1/2):35–72.

Powell, R. and Yawson, A. (2007). Are corporate restructuring events driven by common factors? implications for takeover prediction. *Journal of Business Finance & Accounting*, 34(7-8):1169–1192.

Powell, R. G. (1997). Modelling takeover likelihood. *Journal of Business Finance & Accounting*, 24(7-8):1009–1030.

Powell, R. G. (2001). Takeover prediction and portfolio performance: A note. *Journal of Business Finance & Accounting*, 28(7-8):993–1011.

Rege, U. P. (1984). Accounting ratios to locate take-over targets. *Journal of Business Finance & Accounting*, 11(3):301–311.

Riahi-Belkaoui, A. (1996). *Accounting, a multiparadigmatic science*. Greenwood Publishing Group.

Rodrigues, B. D. and Stevenson, M. J. (2013). Takeover prediction using forecast combinations. *International Journal of Forecasting*, 29(4):628–641.

Ruback, R. S. (1987). An overview of takeover defenses. In *Mergers and acquisitions*, pages 49–68. University of Chicago Press.

Schwert, G. W. (2000). Hostility in takeovers: in the eyes of the beholder? *The Journal of Finance*, 55(6):2599–2640.

Shleifer, A. and Vishny, R. W. (2003). Stock market driven acquisitions. *Journal of Financial Economics*, 70(3):295–311.

Shumway, T. (2001). Forecasting bankruptcy more accurately: A simple hazard model. *The journal of business*, 74(1):101–124.

Singh, A. and Singh, T. D. (1971). *Take-overs: Their Relevance to the Stock Market and the Theory of the Firm*, volume 19. CUP Archive.

Slowinski, R., Zopounidis, C., and Dimitras, A. (1997). Prediction of company acquisition in greece by means of the rough set approach. *European Journal of Operational Research*, 100(1):1–15.

Sorter, G. H. (1969). An" events" approach to basic accounting theory. *The Accounting Review*, 44(1):12–19.

Stevens, D. L. (1973). Financial characteristics of merged firms: A multivariate analysis. *Journal*

of Financial and Quantitative analysis, pages 149–158.

Taffler, R. J. (1984). Empirical models for the monitoring of uk corporations. *Journal of Banking & Finance*, 8(2):199–227.

Taussig, R. A. and Hayes, S. L. (1968). Cash take-overs and accounting valuations. *The Accounting Review*, 43(1):68–74.

Tsagkanos, A., Georgopoulos, A., and Siriopoulos, C. (2007). Predicting greek mergers and acquisitions: a new approach. *International Journal of Financial Services Management*, 2(4):289–303.

Tuch, C. and O'Sullivan, N. (2007). The impact of acquisitions on firm performance: A review of the evidence. *International Journal of Management Reviews*, 9(2):141–170.

Tunyi, A. (2019). Firm size, market conditions and takeover likelihood. *Review of Accounting and Finance*.

Tunyi, A. A. (2020). Revisiting acquirer returns: Evidence from unanticipated deals. *Journal of Corporate Finance*, page 101789.

Tunyi, A. A. and Ntim, C. G. (2016). Location advantages, governance quality, stock market development and firm characteristics as antecedents of african m&as. *Journal of International Management*, 22(2):147–167.

Tunyi, A. A., Ntim, C. G., and Danbolt, J. (2019). Decoupling management inefficiency: Myopia, hyperopia and takeover likelihood. *International Review of Financial Analysis*, 62:1–20.

Tzoannos, J. and Samuels, J. M. (1972). Mergers and takeovers: the financial characteristics of companies involved. *Journal of Business Finance*, pages 5–16.

Vance, J. O. (1969). Is your company a take-over target. *Harvard Business Review*, 47(3):93.

Walter, R. M. (1994). The usefulness of current cost information for identifying takeover targets and earning above-average stock returns. *Journal of Accounting, Auditing & Finance*, 9(2):349–377.

Wang, Y. and Lahr, H. (2017). Takeover law to protect shareholders: Increasing efficiency or merely redistributing gains? *Journal of Corporate Finance*, 43:288–315.

Wansley, J. W., Lane, W. R., and Yang, H. C. (1983). Abnormal returns to acquired firms by type of acquisition and method of payment. *Financial management*, pages 16–22.

Watts, R. L. and Zimmerman, J. L. (1978). Towards a positive theory of the determination of accounting standards. *Accounting review*, pages 112–134.

Watts, R. L. and Zimmerman, J. L. (1990). Positive accounting theory: a ten year perspective. *Accounting review*, pages 131–156.

Whited, T. M. and Wu, G. (2006). Financial constraints risk. *The Review of Financial Studies*, 19(2):531–559.

Zanakis, S. and Zopounidis, C. (1997). Prediction of greek company takeovers via multivariate analysis of financial ratios. *Journal of the Operational Research Society*, 48(7):678–687.

Table 1 Summary of key studies

"Authors" indicates the names of the authors. "Pub. Year" indicates the year in which the paper was published. "Sample period" indicates the coverage of the empirical analysis. "Context" indicates the sample country. Here, CAN refers to Canada, USA United States and UK United Kingdom. The studies are listed based on the date of publication with the earliest studies at the top of the table.

Authors	Pub. Year	Sample period	Context
Studies in takeover prediction: First era (1968-1985)			
Hayes and Taussig	1968	1956-1967	USA
Vance	1969	–	USA
Simkowitz and Monroe	1971	1968	USA
Singh	1971	1954-1960	UK
Tzoannos and Samuels	1972	1967-1968	UK
Stevens	1973	1966	USA
Keuhn	1975	1957-1959	UK
Belkaoui	1978	1960-1968	CAN
Wansley and Lane	1983	1975-1977	USA
Dietrich and Sorensen	1984	1969-1973	USA
Rege	1984	1962-1973	Canada
Hasbrouck	1985	1977-1982	USA
Studies in takeover prediction: Second era (1986-2002)			
Bartley and Boardman	1986	1978	USA
Palepu	1986	1971-1979	USA
Barnes	1990	1986-1987	UK
Bartley and Boardman	1990	1975-1981	USA
Ambrose and Megginson	1992	1981-1986	USA
Walter	1994	1981-1984	USA
Powell	1997	1984-1991	UK
Slowinski et al.	1997	1983-1990	Greece
Zanakis and Zopounidis	1997	1983-1990	Greece
Barnes	1998	1991-1993	UK
Barnes	1999	1991-1993	UK
Barnes	2000	1991-1993	UK
Powell	2001	1986-1995	UK
Studies in takeover prediction: Third era (2003-2009)			
Espahbodi and Espahbodi	2003	1993-1997	US
Tartari et al.	2003	1998-2000	UK
Doumpos et al.	2004	2000-2002	UK
Powell	2004	1986-1985	UK
Powell and Yawson	2005	1986-2000	UK
Pasiouras et al.	2006	1998-2002	EU
Powell and Yawson	2007	1992-2002	UK
Tsagkanos et al.	2007	1995-2001	Greece
Brar et al.	2009	1992-2008	EU
Cremers et al.	2009	1981-2004	USA
Ouzounis et al.	2009	2001-2005	UK
Studies in takeover prediction: Fourth era (2010-2018)			
Pasiouras and Tanna	2010	1998-2002	EU
Bhanot et al.	2010	1980-2000	USA
Cornett et al.	2010	1979-2004	USA
De and Jindra	2012	1980-2006	USA
Rodrigues and Stevenson	2013	1999-2011	Australia
Danbolt et al.	2016	1986-2011	UK
Tunyi and Ntim	2016	1996-2012	Africa