


# Earnings thresholds in South Africa listed enterprises: Manipulating research and developmental expenditures



**Author:**  
Zhenjia Liu<sup>1</sup> 

**Affiliation:**  
<sup>1</sup>School of Accounting and Finance, Tan Kah Kee College, Xiamen University, Xiamen, China

**Corresponding author:**  
Zhenjia Liu,  
2240328588@qq.com

**Dates:**  
Received: 25 Mar. 2022  
Accepted: 20 Dec. 2022  
Published: 12 Apr. 2023

**How to cite this article:**  
Liu, Z., 2023, 'Earnings thresholds in South Africa listed enterprises: Manipulating research and developmental expenditures', *South African Journal of Economic and Management Sciences* 26(1), a4600. <https://doi.org/10.4102/sajems.v26i1.4600>

**Copyright:**  
© 2023. The Author.  
Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

**Read online:**



Scan this QR code with your smart phone or mobile device to read online.

**Background:** Research and developmental (R&D) expenditure directly affects profits. Therefore, managers are likely to manipulate R&D expenditure to meet earnings thresholds.

**Aim:** This study investigates whether managers manipulate R&D expenditure to meet earnings thresholds, while analysing whether the prospect theory explains this behaviour.

**Setting:** The setting is 62 South African firms listed on the Johannesburg Stock Exchange (JSE) studied from 2011 to 2019.

**Method:** We collected 379 annual samples from the S&P Capital IQ database and applied the earnings distribution model to estimate the effect of the prospect theory on earnings management.

**Results:** Most South African listed enterprises have earnings above zero, or have avoided reporting earnings in decline before earnings manipulation. Furthermore, the study's findings reveal that enterprises that have earnings above zero, or have maintained their earnings in the previous period after manipulation, are risk lovers, whereas enterprises with earnings below zero, or lower than those in the previous period, are risk averters.

**Conclusion:** South African listed enterprises do not have a tendency to manipulate R&D expenditures to achieve earnings above zero or avoid reporting declining earnings. The prospect theory also fails to explain their behaviour.

**Contribution:** This study is the first to analyse how the prospect theory explains the behaviour of earnings manipulation by using a sample of South African listed enterprises and thereby fills a research gap.

**Keywords:** earnings thresholds; South Africa; R&D expenditures; earnings management; earnings above zero; avoided earnings decreases.

## Introduction

Stakeholders generally focus on performance, whereas enterprise managers generally pursue long-term profits, with the return on assets, return on equity, and earnings per share considered to be the main targets. The data of these indicators are based on earnings.

Managers maintain competitiveness and improve the performance of enterprises by influencing operations through research and developmental (R&D) activities. Governments in various countries often provide R&D grants or implement R&D tax-saving policies to support R&D activities. Nevertheless, R&D activities may be limited regarding funding and are not guaranteed to bring substantial benefits. These activities are dependent on expenditures, therefore managers may manipulate earnings through R&D expenditures (Canace, Jackson & Ma 2018; Hsiao et al. 2017; Le & Lee 2021; Seybert 2010; Sun 2021; Yang et al. 2022; Zhang & He 2013; Zhu et al. 2015).

The literature indicates that managers are likely to manipulate earnings to avoid having to report losses and declining earnings, or to meet analyst forecasts (Bissessur & Veenman 2016; Byun & Roland 2022; Carvajal, Coulton & Jackson 2017; Choi, Choi & Lee 2016; Griffin & Lont 2021; Rennekamp, Rupar & Seybert 2020; Shin 2019). However, the literature does not reveal how R&D expenditures are manipulated to achieve earning thresholds.

According to Kahneman and Tversky's prospect theory (1979), managers tend to pursue risk to avoid expected losses when enterprise performance is below the target level. By contrast, when

enterprise performance is higher than the target level, managers prefer risk aversion. Shen and Chih (2005), as well as Wasiuzzaman, Sahafzadeh and Nejad (2015) employ this theory to analyse the behaviour of managers manipulating earnings. On the basis of the prospect theory, Shen and Chih (2005) discover that decisions are made in accordance with the gains or losses obtained at different points of reference. This explains why managers are motivated to manipulate earnings to meet earnings thresholds (i.e. their target performance level). However, the literature does not demonstrate how the prospect theory can be applied to interpret the earnings management of South African listed enterprises. Accordingly, the present study explores the following questions: (1) Do listed South African enterprises manipulate earnings to meet earnings thresholds? (2) Do South African listed enterprises manipulate R&D expenditures to meet earnings thresholds? and (3) Does the prospect theory explain the behaviour of listed South African enterprises of manipulating R&D expenditures to meet earnings thresholds?

We apply a linear regression model to calculate discretionary R&D expenditures and analyse the earnings thresholds of avoiding reported losses and earnings in decline by using frequency distribution histograms. We refer to 379 annual samples, reported by 62 enterprises in 2011–2019 to explore whether South African listed enterprises manipulate R&D expenditures to meet earnings thresholds and investigate their behaviour by using the prospect theory. The results reveal that most listed South African enterprises do not have a tendency to manipulate earnings through R&D expenditures to avoid having to report losses and declining earnings; few samples show losses, or earnings lower than those of the previous period before earnings manipulation. Moreover, these enterprises tend to pursue risk when their earnings meet earnings thresholds, and prefer risk aversion when their earnings are below the earnings thresholds. Therefore, the prospect theory cannot explain the earnings management behaviour of the enterprises.

## Literature review

### Earnings management in Africa

Pududu and De Villiers (2016) indicate that South African enterprises do not manipulate their earnings to avoid losses or declining earnings, because the stock exchanges in South Africa are small in scale and external investors pay more attention to the revenue or earnings per share. Desta (2017) explores whether South African banks manipulate earnings by using loan loss provisions and discovers that the loan to deposit ratio, return on assets, pre-tax earnings, and earnings before bad debt reserves do affect bad debt reserves. In addition, earnings manipulation has a strong effect on bad debt reserves. Liu and Wang (2017) study how the use of real activities or discretionary accrual activities in African countries affect the economic value added. The results indicate that the use of real activities to manipulate earnings is positively correlated with the economic value

added. Waweru and Prot (2018) investigate whether Kenyan and Tanzanian enterprises restrict earnings management. The results reveal that board independence, board gender diversity, and director share ownership are significantly and positively correlated with discretionary accrual activities, which indicates that enterprise governance systems cannot effectively restrict earnings manipulation. Jordaan, De Klerk and De Villiers (2018) report that African enterprises realise their commitment to stakeholders by inflating earnings through social responsibility activities. Okyere, Fiador and Sarpong-Kumankoma (2021) analyse the influence of the earnings management and governance of sub-Saharan African enterprises on capital structure and discover that non-financial enterprises with low equity, or high financial leverage, tend to implement earnings management and that an excessively high leverage is correlated with earnings management. The research also reveals that enterprise governance could minimise earnings management behaviour.

### Earnings thresholds through manipulating research and developmental expenditure

Earnings management involves changing reported figures or performance according to managers' subjective judgement, and adjustment of transaction matters (Healy & Wahlen 1999). Cohen, Dey and Lys (2008) report that managers mislead report users by adjusting real activities to pursue personal interests, because real activities cannot easily be observed by auditors or the relevant authorities. Habib et al. (2022) demonstrate that information asymmetry is present between enterprises and external investors. Thus, managers manipulate earnings through real activities and distort actual performance to meet earnings thresholds and pursue their personal interests. The literature indicates that managers are also motivated to manipulate earnings to maintain earnings thresholds. Enterprises are reported to manipulate earnings to avoid reporting losses (Hansen 2010) and earnings in decline (Kama & Weiss 2013).

Research and developmental expenditures involve spendings related to business activities (e.g. materials, personnel salaries, bonus, and leases for R&D activities) and have the characteristics of working capital. Research and developmental activities may take years to bring benefits; therefore, managers may manipulate earnings through R&D activities to apparently improve performance (Zhang & He 2013). Managers also manipulate R&D expenditures to meet earnings thresholds (Dumas 2017; Tami, Kang & Schultze 2016). Dumas (2017) discovers that managers may avoid reporting losses and earnings in decline by manipulating R&D expenditures. Accordingly, we propose the following hypotheses:

H1: South African listed enterprises tend to adjust R&D expenditures as a form of earnings manipulation to avoid showing losses.

H2: South African listed enterprises tend to adjust R&D expenditures as a form of earnings manipulation to avoid showing a decline in earnings.

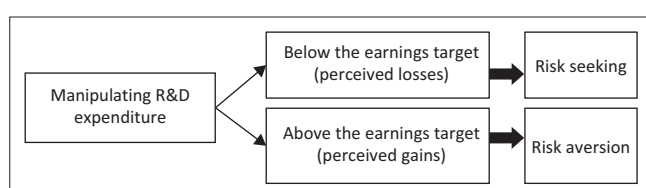
Tversky and Kahneman (1974) report that when actual performance is below the target level, decision-makers tend to engage in risky activities to gain profits. According to Kahneman and Tversky's prospect theory (1979), managers make decisions on the basis of their specific target levels and attach importance to value (i.e. the gain or loss experienced after a decision is executed). Losses occur when the actual performance is below decision-makers' target level which may negatively affect utility and cause the value function to be S-shaped. Therefore, managers pursue risk when faced with losses but avoid risk when faced with gains. Wealth increases most and the value-added is higher when personal wealth is transformed from losses to gains. Shen and Chih (2005) report that the prospect theory may be used to explain the motivations for earnings management. Managers may manipulate earnings to meet specific earnings thresholds to obtain rewards. Managers may manipulate earnings to avoid reporting losses or declining earnings. When manipulating earnings to achieve goals, managers give higher value for the enterprise they belong to, which is consistent with the prospect theory. Accordingly, we propose the following hypotheses and establish our theoretical framework (Figure 1):

H3: The prospect theory may explain why managers of South African listed enterprises use R&D expenditures to manipulate earnings to avoid having to show losses.

H4: The prospect theory may explain why managers of South African listed enterprises use R&D expenditures to manipulate earnings to avoid having to show earnings in decline.

## Methodology

We gathered 379 annual samples, reported by 62 South African listed enterprises (excluding banks, investment companies, and insurance companies), in 2011–2019. These listed enterprises in South Africa are classified into the following primary sectors: Industrials (25.81%); Materials (20.97%); Consumer Staples (17.74%); Information Technology (16.13%); Health Care (8.06%); Communication Services (4.84%); Consumer Discretionary (4.84%); Energy (1.61%). This is an unbalanced panel. The data are collected from the S&P Capital IQ database. Research and developmental expenditures not disclosed in the financial statements or database are regarded as missing values. Cross-sectional data are employed for linear regression to calculate discretionary R&D expenditures. The models and variables employed are as follows:



R&D, research and development.

**FIGURE 1:** Theoretical framework.

## Discretionary research and developmental expenditures

Discretionary R&D expenditures (Zhu et al. 2015) are calculated using the following model:

$$\frac{TRD_{it}}{ASSETS_{it-1}} = a_0 + a_1 \left( \frac{1}{ASSETS_{it-1}} \right) + a_2 \left( \frac{SALES_{it-1}}{ASSETS_{it-1}} \right) + a_3 ROA_{it} + \varepsilon_{it} \quad [\text{Eqn 1}]$$

Where  $TRD_{it}$  is the  $t$  year R&D expenditure,  $ASSETS_{it-1}$  is the  $t-1$  year assets,  $SALES_{it-1}$  is the  $t-1$  year sales revenue,  $ROA_{it}$  is the  $t$  year earnings divided by the  $t-1$  year assets,  $\varepsilon_{it}$  is the residual value of the  $t$  year and model multiplied by the  $t-1$  year assets to estimate the discretionary R&D expenditures (i.e. earnings management behaviour), and the  $t$  year earnings before R&D expenditure manipulation is earnings minus discretionary R&D expenditures.

## Earnings thresholds

The earnings thresholds are measured using the model of Gunny (2010) and two types of histograms.

### Avoid earnings loss

If the  $t$  year manipulated earnings are more than, or equal to 0, the earnings threshold of avoiding reporting losses is met.

### Avoid earnings decreases

If the  $t$  year manipulated earnings are more than or equal to those in the  $t-1$  year, the earnings threshold of avoiding having to show decreased earnings is met.

We analyse whether enterprises manipulate reports to meet earnings thresholds. Our samples include data on earnings before manipulation and manipulated earnings. The distribution approach proposed by DeGeorge, Patel and Zeckhauser (1999) is used to test whether earnings manipulation is the most effective means of meeting earnings thresholds. The earnings before manipulation and the manipulated earnings are each divided by the assets in the previous period. As suggested by Gunny (2010), we set the interval width to 0.01 and perform an analysis of the frequency distribution within the interval width. The frequency of managers manipulating earnings to meet earnings thresholds is distributed on the right side of the histogram, whereas the frequency of managers not manipulating earnings to meet earnings thresholds is distributed on the left of the histogram.

## Explanation of the motivation for earnings management through the prospect theory

On the basis of the relationship between risk and return, Shen and Chih (2005) apply the prospect theory to analyse the behaviour of earnings management. The model is as follows:

$RISK_{it,j} = a_{0it,H} + a_{1it,H} RETURN_{it,j} + \varepsilon_{it,j}$  j is high (H) earnings groups

$RISK_{it,j} = a_{0it,L} + a_{1it,L} RETURN_{it,j} + \varepsilon_{it,j}$  j is low(L) earnings groups

where  $RISK_{it,j}$  is the standard deviation of each enterprise's earnings or change in earnings after manipulation during the sample period, and  $RETURN_{it,j}$  is the means of each enterprise's earnings or change in earnings after manipulation during the sample period. The samples are divided into two groups: high earnings (H), that is, earnings above zero or a change in earnings exceeding those in the previous period after manipulation during the sampling period, and low earnings (L), that is, earnings below zero, or a change in earnings lower than those in the previous period after manipulation.

If  $a_{1it,L}$  is negative,  $a_{1it,H}$  is positive, and the absolute value of  $a_{1it,L}$  is larger than the absolute value of  $a_{1it,H}$ , the relationship between risk and return is considered to be verified, indicating that the prospect theory does explain earnings thresholds being the target levels for enterprise decision-making. The model also reveals how variables, such as leverage (Díez-Esteban et al. 2017), size (Gupta 2017), growth (Ferreira, Zanini & Alves 2019), enterprise age (Gupta 2017), and industry (Munoz et al. 2020), control the relationship between risk and return:

$RISK_{it,j} = a_{0it,H} + a_{1it,H} RETURN_{it,j} + a_2 LEV_{it,j} + a_3 SIZE_{it,j} + a_4 GWOWTH_{it,j} + a_5 AGE_{it,j} + a_6 INDU_{it,j} + \varepsilon_{it,j}$  j is high(H) earnings groups [Eqn 2]

$RISK_{it,j} = a_{0it,L} + a_{1it,L} RETURN_{it,j} + a_2 LEV_{it,j} + a_3 SIZE_{it,j} + a_4 GWOWTH_{it,j} + a_5 AGE_{it,j} + a_6 INDU_{it,j} + \varepsilon_{it,j}$  j is low(L) earnings groups [Eqn 3]

We define the control variables with reference to Díez-Esteban et al. (2017), Munoz et al. (2020), Ferreira et al. (2019), and Gupta (2017) as follows:  $LEV_{it,j}$  is the  $t$  year debt divided by the  $t$  year assets,  $SIZE_{it,j}$  is the natural logarithm of the  $t$  year assets,  $GWOWTH_{it,j}$  is (the assets in the  $t$  year minus the  $t-1$  year assets)/the  $t-1$  year assets,  $AGE_{it,j}$  is the number of years from the establishment of the enterprise to the  $t$  year, and  $INDU_{it,j}$  is a dummy variable. The  $INDU_{it,j}$  for enterprises related to pharmaceutical preparation, computer office equipment, electronic equipment, and industrial equipment is set to 0, and that for other enterprises is set to 1.

## Empirical results

### Descriptive statistics

Table 1 presents the results of the model of Zhu et al. (2015), which is used to estimate R&Ds expenditures. Table 2 presents the descriptive statistics of the model (the residuals of the model all passed the  $t$  test), including the earnings before R&D expenditure manipulation and manipulated earnings, as determined by the net profit in the income statement.

**TABLE 1:** Regressions of Zhu et al. (2015) model (samples = 379).

Dependent variable	$\frac{TRD_{it}}{ASSETS_{t-1}}$
Intercept	-0.00059
1	0.525091***
$\frac{ASSETS_{t-1}}$	
$\frac{SALES_{it-1}}{ASSETS_{t-1}}$	0.002957*
$ROA_{it}$	-0.02841***
$R^2$	0.537731
$F$ value	147.5685***

\* $p < 0.1$ ; \*\*\* $p < 0.01$ .

$TRD_{it}$  is the  $t$  year R&D expenditure,  $ASSETS_{t-1}$  is the  $t-1$  year assets,  $SALES_{t-1}$  is the  $t-1$  year sales revenue,  $ROA_{it}$  is the  $t$  year earnings divided by the  $t-1$  year assets.

R&D, research and development.

**TABLE 2:** Descriptive statistics (2011–2019,  $N = 379$ ; million US dollars).

Variables	Max	Minimum	Average
$\varepsilon_{it}$ of $TRD_{it}$	196.2	-71.1	2.4
Earnings are managed	5535.8	-2230.0	99.5
Earnings before manipulating total R&D expense	5390.6	-2158.9	97.1

$\varepsilon_{it}$  represents the total R&D expenditures of year  $t$  (Equation 1). 'Earnings are managed', is supposed to indicate the earnings after the manipulation.

R&D, research and development.

The mean discretionary R&D expenditure is US\$24 million, indicating that South African listed enterprises tend to reduce earnings by manipulating R&D expenditures.

### Empirical test

We use histograms to determine the distribution of the manipulated earnings. The frequency distribution results presented in Figure 2 and Figure 3 have normal distributions, which is consistent with the results of El-Sayed Ebaïd (2012). The frequency distribution results presented in Figure 4 and Figure 5 are also consistent with the results of El-Sayed Ebaïd (2012), and have normal distributions. The distribution of the manipulated earnings is skewed to the right and higher than the earning threshold. This indicates that most of the sample enterprises have earnings above zero and do not have declining earnings before R&D expenditure manipulation. Only 63 of the samples have earnings below zero before manipulation; 181 samples have declining earnings before manipulation. Therefore, hypotheses 1 and 2 are not supported. Potential reasons therefore are as follows: (1) South African listed enterprises do not focus on R&D activity, and thus, R&D activity has a smaller effect on earnings thresholds. (2) Managers use other methods to manipulate earnings to meet earnings thresholds; manipulating R&D expenditures to meet earnings thresholds is not always employed as an accounting policy. (3) External investors only value performance and do not consider earnings, which reduce manager motivation to manipulate earnings. (4) Because enterprises are evaluated by analysts or investors, they must disclose more true information. Therefore, if the earnings, before manipulation, exceed the earnings threshold, this is considered good news. However, if the earnings before manipulation are below the earnings threshold, this is bad news. When earnings meet the threshold before manipulation,

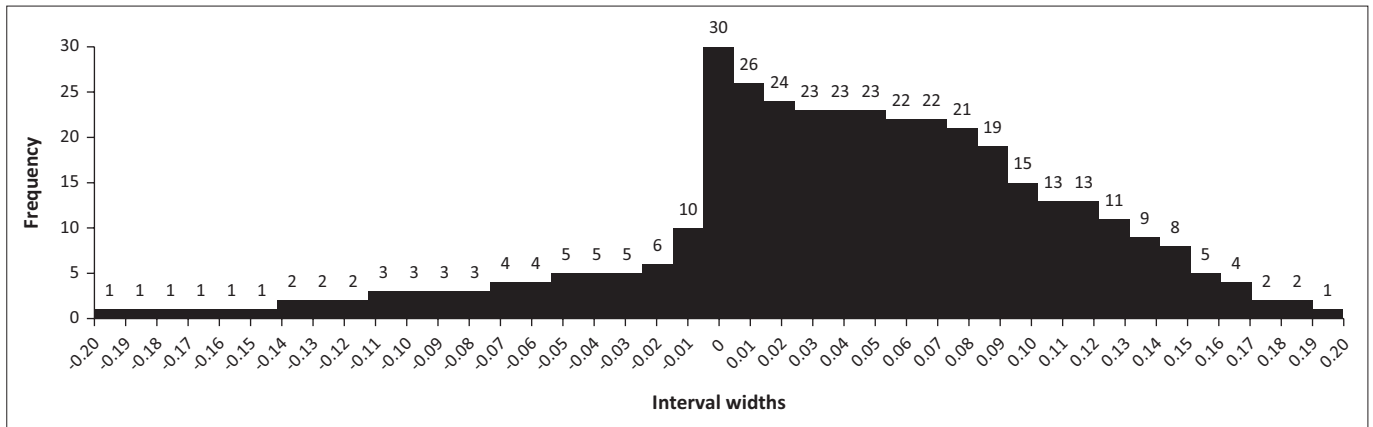


FIGURE 2: Histogram of earnings thresholds indicating whether earnings are above zero before the manipulation of research and developmental expenditures (sample = 379).

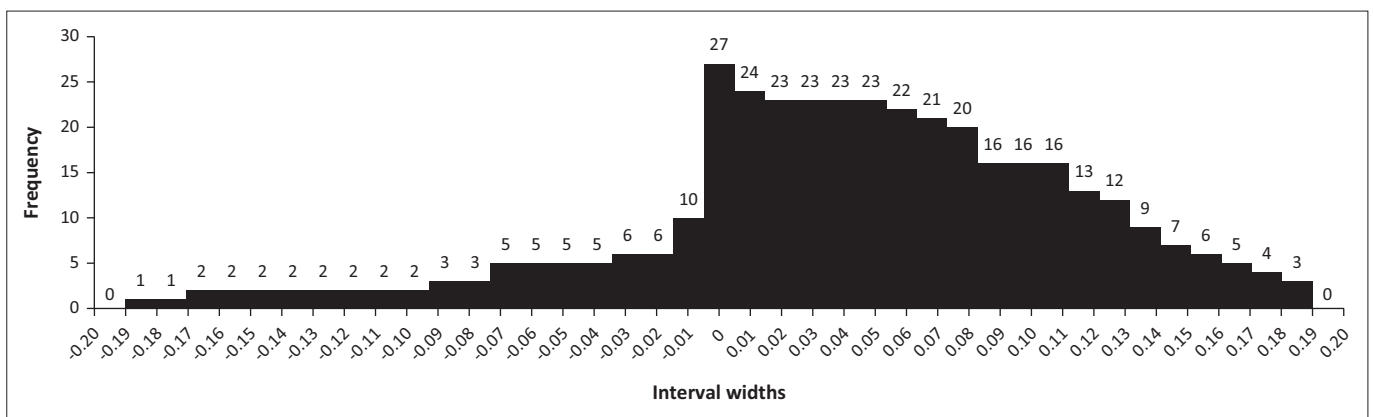


FIGURE 3: Histogram of earnings thresholds indicating whether earnings are above zero after the manipulation of research and developmental expenditures (sample = 379).

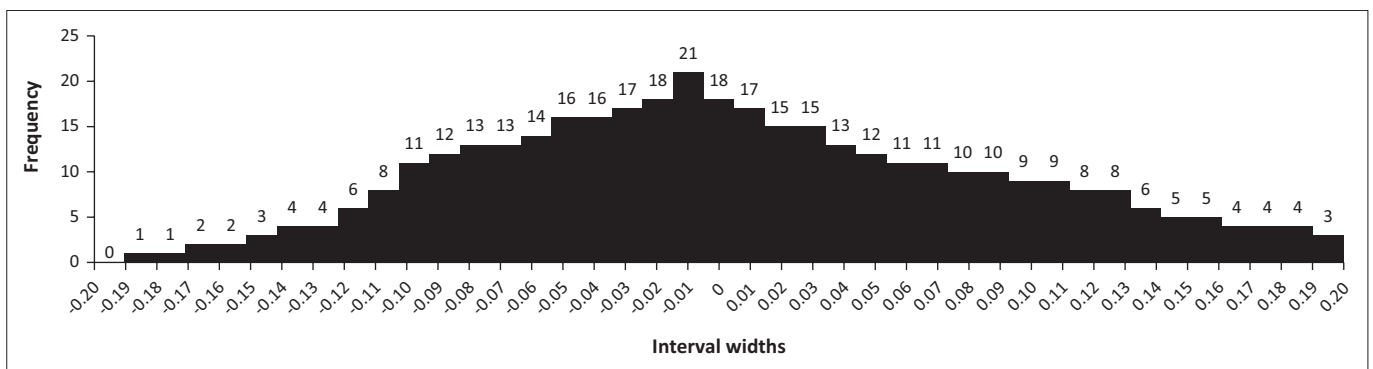


FIGURE 4: Histogram of earnings thresholds indicating whether declining earnings are avoided before the manipulation of research and developmental expenditures (sample = 379).

the information asymmetry between enterprises and external investors is reduced, and a low earnings threshold may indicate that an enterprise's future investment plans are not supported by a sufficient cash flow. (5) Earnings may be highly related to stock prices if investors value earnings. To pursue the overall interests of their enterprises, managers are likely to ensure that earnings are above zero, or avoid earnings in decline before they manipulate R&D expenditures, which may have a more positive effect on stock prices than losses or declining earnings do.

According to Kahneman and Tversky's prospect theory (1979), managers make decisions on the basis of their specific target levels. When the actual performance is below the target

level, loss occurs and managers are more likely to pursue risk. When the actual performance is above the target level, gains occur and managers tend to avoid risk. Shen and Chih (2005) conduct a study on the basis of the prospect theory and report that personal gains or losses are influenced by the target level. Earnings management is risky; therefore, earnings below the target level are more likely to prompt managers to manipulate earnings to meet thresholds and pursue their personal interests. Accordingly, specific earnings thresholds may be considered manager target levels.

As indicated in Table 3, to avoid losses (earnings  $\geq 0$ ),  $a_{1_{H,L}}$  should be negative,  $a_{1_{H,H}}$  should be positive, and the absolute value of  $a_{1_{H,L}}$  lower than  $a_{1_{H,H}}$ , respectively. This indicates that

enterprises tend to pursue risk when earnings are above zero and avoid risk when earnings are below zero, and that the earnings thresholds to avoid losses cannot be considered manager target levels, whereas the prospect theory cannot explain how the manipulation of earnings through R&D expenditures of South African listed enterprises affects behaviour related to avoiding reporting losses. Hypothesis 3 is not supported.

To avoid showing earnings in decline (change in earnings  $\geq 0$ ),  $a_{1i,L}$  and  $a_{1i,H}$  should be positive, and the absolute value of  $a_{1i,L}$  more than  $a_{1i,H}$ , respectively. This indicates that enterprises tend to pursue risk when earnings are above the previous period but avoid risk when earnings are no longer maintained and that the earnings thresholds, to avoid having to report declining earnings, cannot be considered the manager's target levels, while the prospect theory can also not explain how the manipulation of earnings through R&D expenditures of South African listed enterprises affects behaviour related to avoid showing earnings in decline. Hypothesis 4 is not supported. In summary, the prospect theory cannot explain the behaviour of South African listed enterprises related to manipulating R&D expenditures to meet earnings thresholds.

As recommended in the literature, we incorporate variables such as leverage (Díez-Esteban et al. 2017), size (Gupta 2017), growth (Ferreira et al. 2019), enterprise age (Gupta 2017), and industry (Munoz et al. 2020) to control for the relationship between risk and return. The results reveal that regardless of whether R&Ds expenditures are manipulated to meet earnings thresholds, the debt ratio (i.e. leverage) is not significantly positively correlated with risk. When the manipulated earnings meet, or not the earnings thresholds, the risk an enterprise runs, increase with the debt ratio. Regardless of whether R&D expenditures are manipulated to meet earnings thresholds, enterprise size is significantly positively correlated with risk. When manipulated earnings do not meet earnings thresholds, enterprises of a larger size encounter greater risk. When earnings are manipulated to avoid a decline in earnings, the growth of the enterprise is significantly negatively correlated with risk. Regardless of whether R&D expenditures

are manipulated to meet earnings thresholds, enterprise age is significantly negatively correlated with risk, although this correlation is non-significant when the earnings remain below zero after manipulation, and the particular industry is not significantly correlated with risk.

## Conclusion

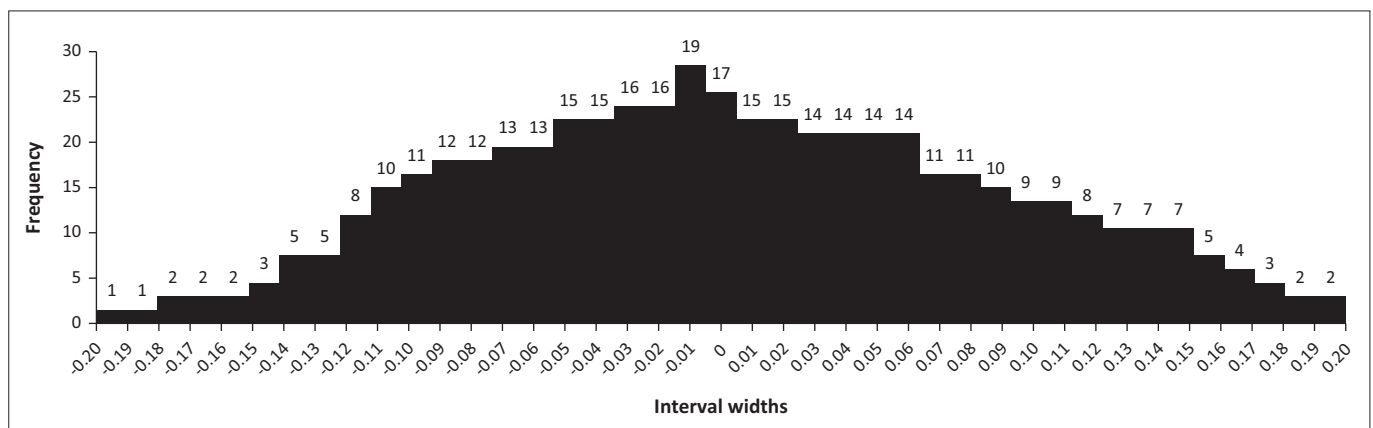
Research and developmental expenditures play a crucial role in enterprise operations. Because R&D activities are dependent on expenditures, managers are likely to manipulate R&D expenditures to meet specific earnings thresholds. In the present study, we collected 379 annual samples reported by 62 South African listed companies in 2011-2019 to analyse the behaviour of managers of probably manipulating R&D expenditures to meet earnings thresholds.

The results reveal that most samples have earnings above zero, and therefore have no need to show declining earnings or manipulate R&D expenditures. A possible reason for this is that South African listed enterprises do not focus on R&D activity, do not consider the effect of R&D expenditures on profits, and are not influenced by

**TABLE 3:** Testing the prospect theory as motivation to manage earnings.

Variables	1		Panel B	
	Threshold: rearnings $\geq 0$ (avoiding earnings loss)		Threshold: Change in earnings $\geq 0$ (avoiding earnings decreases)	
	High earnings group	Low earnings group	High earnings group	Low earnings group
Intercept	-127.558**	-29.305***	-169.129***	-194.308***
$RETURN_{it,j}$	0.368115***	-0.13939	0.152452***	0.394988***
$LEV_{it,j}$	176.1628	77.25333	168.9581	82.97794
$SIZE_{it,j}$	39.67574***	70.16178***	47.51829***	60.80801***
$GWOWTH_{it,j}$	-78.0869	-13.1916	-131.333***	0.772853
$AGE_{it,j}$	-1.41651***	-0.95555	-0.93161*	-1.82698***
$INDU_{it,j}$	-81.6531	9.863462	-40.8783	-74.4756
$R^2$	0.35125	0.483342	0.26987	0.401866
$F$ value	28.97364***	11.4466***	13.13585***	21.15601***
$N$	313	66	198	181

$LEV_{it,j}$  is the  $t$  year debt divided by the  $t$  year assets,  $SIZE_{it,j}$  is the natural logarithm of the  $t$  year assets,  $GWOWTH_{it,j}$  is the assets in the  $t$  year minus the  $t-1$  year assets/the  $t-1$  year assets,  $AGE_{it,j}$  is the number of years from the establishment of the enterprise to the  $t$  year, and  $INDU_{it,j}$  is a dummy variable: the enterprises related to pharmaceutical preparation, computer office equipment, electronic equipment, and industrial equipment is set to 0, and that for other enterprises is set to 1.



**FIGURE 5:** Histogram of earnings thresholds indicating whether declining earnings are avoided after the manipulation of research and developmental expenditures (sample = 379).

other financial incentives. The aforementioned findings indicate that these companies do not have the need or the tendency to manipulate earnings through R&D expenditures to achieve earnings above zero or avoid showing a decline in earnings.

According to Shen and Chih (2005), the prospect theory indicates that decisions are made using various reference points. The decisions directly affect their personal losses or gains. They explore how the prospect theory supports the fact that managers manipulate earnings to meet earnings thresholds and pursue their personal interests and how this relates to the relationship between risk and return. However, the results of the present study indicate that South African listed enterprises do not have a tendency to achieve an earning above zero or avoid reporting earnings in decline by manipulating R&D expenditures and, therefore, do not support the proposal of Shen and Chih (2005). The findings of the present study also do not support the view that earnings management behaviour could be explained by the prospect theory.

The contributions of this study are as follows: (1) We explore whether South African listed enterprises manipulate earnings to achieve earnings above zero or avoid reporting declining earnings through R&D expenditures, which is not yet discussed in the literature. (2) We fail to determine the motivation for South African listed enterprises to manipulate earnings to achieve earnings above zero or avoid declining earnings through R&D expenditures by using the prospect theory.

The results we present may serve as a reference for investors, managers, relevant authorities, researchers, and auditors. Investors may estimate the future prospects of enterprises and managers' abilities with reference to our findings. Managers may evaluate target earnings, or implement other earnings management strategies (e.g. investment in non-R&D expenditures or other operative activities) to meet specific earnings thresholds. The relevant authorities and researchers may redefine R&D expenditure or formulate stricter accounting standards for R&D expenditure and establish a more comprehensive tax system to reflect real R&D activities. Investors and the relevant authorities are advised to use more precise methods to investigate the relationship between R&D expenditure and earnings management. Auditors could also use such methods to determine the intention of new customers to manipulate R&D expenditures as a form of earnings management.

This study has the following limitations: (1) We do not analyse the R&D expenditures of all listed enterprises; hence, the results may not reflect the overall situation of South African listed enterprises or be applicable to non-listed enterprises. (2) Research and developmental expenditures are mostly derived from the processes of manufacturing products, providing services, and obtaining intellectual property rights. Accountants record these activities as capitalised R&D expenditure or R&D expenditure according to the situation. However, we are unable to divide the data collected from the database into different categories. (3) The

model for R&D expenditure manipulation may be further improved in future studies. (4) The literature indicates that the overall economy or economic uncertainty affects enterprise operations. Future studies are recommended to analyse how overall economic factors affect enterprises manipulating earnings to meet specific earnings thresholds.

## Acknowledgements

### Competing interests

The author(s) declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

### Author's contributions

Z.L. is the sole author of this article.

### Ethical considerations

The School of Accounting and Finance, Tan Kah Kee college, Xiamen University, China, approved this study. They declared that ethical clearance was not needed.

### Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

### Data availability

Data supporting the findings of this study are available from the corresponding author Z.L. on request.

### Disclaimer

The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of any affiliated agency of the author.

## References

- Bissessar, S.W. & Veenman, D., 2016, 'Analyst information precision and small earnings surprises', *Review of Accounting Studies* 21(4), 1327–1360. <https://doi.org/10.1007/s11142-016-9370-2>
- Byun, S.H. & Roland, K.C., 2022, 'Quarterly earnings thresholds: Making the case for prior quarter earnings', *Journal of Business Finance Accounting* 49(5–6), 690–716. <https://doi.org/10.1111/jbfa.12580>
- Canace, T.G., Jackson, S.B. & Ma, T., 2018, 'R&D investments, capital expenditures, and earnings thresholds', *Review Accounting Studies* 23(1), 265–295. <https://doi.org/10.1007/s11142-017-9428-9>
- Carvajal, M., Coulton, J.J. & Jackson, A.B., 2017, 'Earnings benchmark hierarchy', *Accounting and Finance* 57(1), 87–111. <https://doi.org/10.1111/acfi.12132>
- Choi, J.M., Choi, W. & Lee, E.S., 2016, 'Corporate life cycle and earnings benchmarks', *Australian Accounting Review* 79(26), 415–428. <https://doi.org/10.1111/auar.12100>
- Cohen, D.A., Dey, A. & Lys, T.Z., 2008, 'Real and accrual-based earnings management in the pre- and post-Sarbanes-Oxley periods', *The Accounting Review* 83(3), 757–787. <https://doi.org/10.2308/accr.2008.83.3.757>
- Degeorge, F., Patel, J. & Zeckhauser, R., 1999, 'Earnings management to exceed thresholds', *Journal of Business* 72(1), 1–33. <https://doi.org/10.1086/209601>
- Desta, T., 2017, 'Consequence of loan loss provisions on earnings management behaviour: A study on the best African commercial banks', *South African Journal of Business Management* 48(3), 1–11. <https://doi.org/10.4102/sajbm.v48i3.31>
- Díez-Esteban, J., García-Gómez, C.D., López-Iturriaga, F.J. & Santamaría-Mariscal, M., 2017, 'Corporate risk-taking, returns and the nature of major shareholders: Evidence from prospect theory', *Research in International Business and Finance* 42, 900–911. <https://doi.org/10.1016/j.ribaf.2017.07.025>

- Dumas, G., 2017, 'Processual earnings management: A study of R&D spending of French listed companies', *Accounting Auditing Control* 23(2), 111–141.
- El-Sayed Ebaid, I., 2012, 'Earnings management to meet or beat earnings thresholds evidence from the emerging capital market of Egypt', *African Journal of Economic and Management Studies* 3(2), 240–257. <https://doi.org/10.1108/20400701211265027>
- Ferreira, J.H.L., Zanini, F.A.M. & Alves, T.W., 2019, 'Bank revenue diversification: Its impact on risk and return in Brazilian banks', *Revista Contabilidade & Finanças* 30(79), 91–106. <https://doi.org/10.1590/1808-057x201805810>
- Griffin, P.A. & Lont, D.H., 2021, 'Evidence of an increasing trend in earnings surprises over the past two decades: The role of positive manager-initiated non-GAAP adjustments', *Journal of Business Finance Accounting* 48(9–10), 1525–1559. <https://doi.org/10.1111/jbfa.12527>
- Gunny, K., 2010, 'The relation between earnings management using real activities manipulation and future performance: Evidence from meeting earnings benchmarks', *Contemporary Accounting Research* 27(3), 855–888. <https://doi.org/10.1111/j.1911-3846.2010.01029.x>
- Gupta, R.D., 2017, 'Risk-attitudes of the NSE 500 firms – Bowman's paradox and prospect theory perspectives', *IIMB Management Review* 29(2), 76–89. <https://doi.org/10.1016/j.iimb.2017.04.001>
- Habib, A., Ranasinghe, D., Wu, J.Y.H., Biswas, P.K. & Ahmad, F., 2022, 'Real earnings management: A review of the international literature', *Accounting & Finance* 62(4), 4279–4344. <https://doi.org/10.1111/acfi.12968>
- Hansen, J.C., 2010, 'The effect of alternative goals on earnings management studies: An earnings benchmark examination', *Journal of Accounting Public Policy* 29(5), 459–480. <https://doi.org/10.1016/j.jaccpubpol.2010.06.002>
- Healy, P. & Wahlen, J., 1999, 'A review of the earnings management literature and its implications for standard setting', *Accounting Horizons* 13(4), 365–383. <https://doi.org/10.2308/acch.1999.13.4.365>
- Hsiao, H.F., Liao, S.L., Su, C.W. & Sung, H.C., 2017, 'Product market competition, R&D investment choice, and real earnings management', *International Journal of Accounting & Information Management* 25(3), 296–312. <https://doi.org/10.1108/IJAIM-06-2016-0067>
- Jordaan, L.A., De Klerk, M. & De Villiers, C.J., 2018, 'Corporate social responsibility and earnings management of South African companies', *South African Journal of Economic and Management Sciences* 21(1), a1849. <https://doi.org/10.4102/sajems.v21i1.1849>
- Kahneman, D. & Tversky, A., 1979, 'Prospect theory: An analysis of decision under risk', *Econometrica* 47(2), 263–291. <https://doi.org/10.2307/1914185>
- Kama, I. & Weiss, D., 2013, 'Do earnings targets and managerial incentives affect sticky costs?', *Journal of Accounting Research* 51(1), 201–224. <https://doi.org/10.1111/j.1475-679X.2012.00471.x>
- Le, Q.A. & Lee, C.Y., 2021, 'Earnings pressure and R&D cut: The moderating effects of family control and debt', *Management Research Review* 44(4), 568–587. <https://doi.org/10.1108/MRR-01-2020-0042>
- Liu, Z.J. & Wang, Y.S., 2017, 'Effect of earnings management on economic value added: G20 and African countries study', *South African Journal of Economic and Management Sciences* 20(1), a1247. <https://doi.org/10.4102/sajems.v20i1.1247>
- Munoz, R.M., Sanchez De Pablo, J.D., Salinero, Y. & Pena, I., 2020, 'Risk measures and the risk-return paradox: An analysis in the context of the economic crisis', *Revista Brasileira de Gestao de Negocios* 22(2), 348–362. <https://doi.org/10.7819/rbgn.v22i2.4049>
- Okyere, S.A., Fiador, V. & Sarpong-Kumankoma, E., 2021, 'Earnings management, capital structure, and the role of corporate governance: Evidence from sub-Saharan Africa', *Management and Decisions Economics* 42(6), 1525–1538. <https://doi.org/10.1002/mde.3324>
- Pududu, M.L. & De Villiers, C., 2016, 'Earnings management through loss avoidance: Does South Africa have a good story to tell', *South African Journal of Economic and Management Sciences* 19(1), 18–34. <https://doi.org/10.4102/sajems.v19i1.1124>
- Rennekamp, K., Rupar, K. & Seybert, N., 2020, 'Short selling pressure, reporting transparency, and the use of real and accruals earnings management to meet benchmarks', *Journal of Behavioral Finance* 21(2), 186–204. <https://doi.org/10.1080/15427560.2019.1663853>
- Seybert, N., 2010, 'R&D capitalization and reputation – A driven real earnings management', *The Accounting Review* 85(2), 671–693. <https://doi.org/10.2308/accr.2010.85.2.671>
- Shen, C. & Chih, H., 2005, 'Investor protection, prospect theory, and earnings management: An international comparison of the banking industry', *Journal of Banking & Finance* 29(10), 2675–2697. <https://doi.org/10.1016/j.jbankfin.2004.10.004>
- Shin, J.E., 2019, 'Asymmetric investor reaction around earnings benchmark under economic uncertainty', *Asia-Pacific Journal of Financial Studies* 48(1), 98–122. <https://doi.org/10.1111/ajfs.12246>
- Sun, E.Y., 2021, 'The differential role of R&D and SG&A for earnings management and stock price manipulation', *Contemporary Accounting Research* 38(1), 242–275. <https://doi.org/10.1111/1911-3846.12634>
- Tami, D., Kang, H. & Schultze, W., 2016, 'Capitalizing research & development: Signaling or earnings management', *European Accounting Review* 25(2), 373–401. <https://doi.org/10.1080/09638180.2015.1031149>
- Tversky, A. & Kahneman, D., 1974, 'Judgment under uncertainty: Heuristics and biases', *Science* 185(4157), 1124–1131. <https://doi.org/10.1126/science.185.4157.1124>
- Wasiuzzaman, S., Sahafzadeh, I. & Nejad, N.-R., 2015, 'Prospect theory, industry characteristics and earnings management a study of Malaysian industries', *Review of Accounting and Finance* 14(3), 324–347. <https://doi.org/10.1108/RAF-07-2014-0075>
- Waweru, N.M. & Prot, N.P., 2018, 'Corporate governance compliance and accrual earnings management in eastern Africa: Evidence from Kenya and Tanzania', *Managerial Auditing Journal* 33(2), 171–191. <https://doi.org/10.1108/MAJ-09-2016-1438>
- Yang, D., Wen, J., Jiang, R. & Zhang, S., 2022, 'Earnings management, ownership concentration and capitalization of research & development expenditure', *Emerging Markets Finance and Trade* 58(4), 1191–1205. <https://doi.org/10.1080/1540496X.2021.1980383>
- Zhang, X.D. & He, Y.N., 2013, 'R&D-based earnings management, accounting performance and market return evidence from national-recognized enterprise technology centers in China', *Chinese Management Studies* 7(4), 572–585. <https://doi.org/10.1108/CMS-09-2013-0176>
- Zhu, T.T., Lu, M.T., Shan, Y.W. & Zhang, Y.L., 2015, 'Accrual-based and real activity earnings management at the back door: Evidence from Chinese reverse mergers', *Pacific-Basin Finance Journal* 35, 317–339. <https://doi.org/10.1016/j.pacfin.2015.01.008>