

# ZOMBIE COMPANIES: EXPERIMENTAL RESEARCH FROM REAL ESTATE LISTED SECTORS

Ta Quang Binh<sup>a\*</sup>, Vu Thi Thu Huong<sup>b</sup>, Nguyen Thi Bich Loan<sup>c</sup>

## Abstract

This paper aims to identify factors affecting the ability of a listed company in the real estate industry to become zombie company (ZC) and how real estate enterprises themselves affect the performance of enterprises in such industry. The study uses secondary data collected from the financial statements of 48 listed real estate companies in Vietnam from 2008-2016. Empirical research results show that: (i) during the research period, the highest rate of zombies in real estate listed companies was 32.65% in 2013; (ii) Zombie companies have lower financial performance (ROA, ROE) than healthy companies, and healthy companies also have current solvency and total assets turnover higher than zombie companies; Zombie companies tend to be smaller in scale than healthy companies; (iii) to reduce the risk of becoming a zombie, companies should expand capital scale, increase total asset turnover and increase production and business efficiency; (iv) zombies and revenue growth of zombies have a negative effect on the performance of the whole industry and thus negatively affect the economy.

**Keywords:** zombie companies, listed companies, the real estate sector

**JEL Classifications:** G, M (Times New Roman 9 pt)

**Additional disciplines** (besides field of economics reflected in JEL classifications): e.g., law; political sciences; sociology; psychology; educology; information and communication; mathematics; physics; chemistry; biochemistry; ecology and environment; electricity electronic engineering; construction engineering; transport engineering; environmental engineering; energetics and thermoenergetics; informatics

## 1. Introduction

On July 20, 2000, the Stock Trading Center of Vietnam (STC), located in Ho Chi Minh City, was officially inaugurated. The commencing of its trading on July 28, 2000 was regarded as the birth of Vietnam Stock Market (VSM). Initially, only two equity issues were listed, include of Refrigeration Electrical Engineering Joint Stock Corporation (REE) and Saigon Cable and Telecommunication Material Joint Stock Company (SACOM). As of this date, an additional 20 issues are also listed with a current market capitalization of approximately VND 4,800 billion (US\$239million). The capital market regulator is the State Securities Commission (SSC). It supervises Vietnam's two exchanges: Hanoi securities trading center in Hanoi (HASTC), Ho Chi Minh City stock exchange in Hochiminh city (HOSE) and all licensed securities companies. HOSE, the biggest stock exchange, started its operations with two former SOEs in July of 2000. The number of

listed companies increased rapidly through year 2018 is considered to be a year full of "ups and downs" of Vietnam's stock market. However, the market could not keep its "endurance" because the market in 2019 is more volatile than 2018 due to domestic and foreign factors. The market will continue to fluctuate due to international information such as the prolonged Sino-US trade war, the prospect of slowing growth of the global economy and the short-term sell-off wave in many markets and prices. Oil tends to fluctuate sharply in the second half of 2019 due to OPEC+'s ability to maintain production cuts and the risk of trade conflict to spread globally.

Psychological concerns of global economic downturn and trade risks continue to escalate will cause the domestic and regional markets to have short-term fluctuations and low liquidity. However, foreign capital inflows continue to flow into Vietnam's stock market with the expectation of market upgrading in 2020 and the new draft of Law on Securities will be a strong support factor for market growth and stability. Capitalization of Vietnam's stock market continues to have a strong

<sup>a, b, c</sup> *Thuongmai University, Vietnam, 79 Ho Tung Mau Street, Mai Dich, Cau Giay, Ha Noi, Vietnam*  
*Correspondence: Ta Quang Binh, Thuongmai University, Vietnam, binhqt@tmu.edu.vn*

improvement in 2019, especially on HSX and HOSE. The capitalization of the HSX increased to a record level of VND 3,228 thousands of billions at the end of May. HOSE continued to record a strong capitalization growth when it reached the historic peak of VND 1,020 thousands of billions at the end of March. HNX continued to the decline and reached 184 thousands of billions VND, the lowest level since May 2017. Foreign capital continued to be maintained positively on the HSX and HOSE in the first 5 months of 2019 with net buying respectively of 9,659 billion VND and 394 billion VND. Foreign capital investors remained net sellers on HNX in the first 5 months at 292 billion VND.

Investors often invest in companies with economic efficiency and high growth prospects. However, at present there are enterprises called "plants" or "zombie" companies, which cannot grow despite having the opportunity to access capital, mainly occurs in start-up company. In real life, a series of giant companies around the world collapsed, such as Enron and Worldcom in the US, Parmalat, Ahold, Gescartera and BBVA in Europe (Omer et al., 2020). As of July 22, 2019, the number of companies listed on the exchanges was 2,398 companies with a market capitalization of more than \$400,000 billion. However, according to the provisions of Decree 58/2012/ND-CP, the enterprises loss for 3 consecutive years is subject to delisting. On HOSE, from 2015- July 2019, the number of delisted enterprises was 92, the number of unlisted enterprises on the HNX was 21 as of June 2019. In addition, as of July 12, 2018, the Hanoi Stock Exchange also issued a warning for 98 stocks on the HOSE.

Zombie company is a group of companies not earning enough profit to be able to pay debts or otherwise the business can not repay, has paid and lost for 3 consecutive years. Has fallen into financial distress but still supported and exists. These companies have robbed the opportunity of many businesses strong in economy in an effort to expand the market, turn into a barrier for the development of new and young companies upon accession, reduce capital investment, create a burden on the economy. The problem posed by these companies is considered a major problem faced with not only Japan, USA, China. In Japan eight years after the end of the American property appreciation bubble in 2006 and four years after the onset of the worst international financial crisis since the Great Depression, world economies have yet to return to robust, sustained economic growth (Anderson, 2015). Vietnam is no exception to this effect. The explosion of such companies and its negative

impact on the domestic economy, region and the world made for research aspects of the ZC gradually become a hot topic in the academic world. Studies focused on identification, handling company form 'live' or 'die', 'live' how to live and 'die' in what way....In Viet Nam, ZC exist in the form state-owned companies operating from the state budget but stagnant in activity, poor performance and many years losses, or policy operation bank particularities affect with faith of the public or companies in special field, private companies and foreign invested companies exists in the cocoon when the interest rate is low supported by the government.

According to Ministry of Planning and Investment, during 8 months of 2018, there were 41.660 businesses which were waiting to suspend or dissolve. This number has raised 45,9% comparing with the same period of 2017 (Nguyen Viet Loi, 2017). Additionally, the efficient of these Government companies has declined from 2012 to 2016. ROE has fallen into 39% and ROA has reduced into 30%. The State Bank purchases 0 VND for Ocean Commercial Joint Stock Bank (Oceanbank), Construction Commercial Joint Stock Bank (VNCB), Global Petroleum Commercial Joint Stock Bank (GPbank); Along with that, the State Bank has created opportunities to consolidate and restructure some banks operating at a loss.

More than 10 years have passed since the financial crisis, in which real estate plays a major role. A weak housing mortgage portfolio has crippled the credit market, while the risks of a \$ 40 billion loan tied to commercial real estate have dragged Lehman Brothers to the brink of collapse. Today, the global real estate market is very different from itself before the crisis: lower debt levels, stricter mortgage rules and more modest construction speculation. A huge inflow of capital flows into real estate as the quantitative easing and bond yields narrow, forcing investors to look for other sources of revenue. With interest rates maintained at lows longer than expected a year ago, economists said the Fed will actually cut interest rates this year - resulting in the search for new sources of income that will continue. From the beginning of the 21st century to the present, Vietnam's real estate market is quite complicated and erratic. There have been nearly 18,000 businesses reporting losses, bankruptcy or dissolution. This is a large number that seriously affects the financial efficiency of the economic sector.

However, these cash flows have raised concerns about a "new bubble". Global real estate prices have climbed to new highs, more than 45% from

2007 - according to Real Capital Analytics. However, large cash flows are still flowing into this area. The real estate market once dominated by adept figures, has now become a playground for thousand billions of dollars of capital invested in pensions and insurance funds. This money is mainly managed by investment groups as Blackstone or Brookfield. In 2007, Blackstone managed \$ 19.5 billion in real estate and has now grown 7 times. In early April 2019, real estate investment funds recorded a record \$ 342 billion in undisbursed real estate investments. Inside, up to \$ 62 billion is attributed to loans according to Preqin data- this is also a record number. Zell, the real estate market is "ahead of itself" and greatly affected by too much capital pursuing too few investment opportunities. However, few observers believe the real estate market will face an immediate collapse. As the cause of the economic crisis gradually formed, "zombie" real estate companies and the authors posed research questions:

- (1) What is the influence of financial factors the ability of a listed company in the real estate industry to become zombie companies?
- (2) How do zombie real estate enterprises industry affect the performance of enterprises in the industry?

## 2. Research overview

There is currently no clear consensus on the concept of zombie companies (Papworth, 2013). Current studies rely heavily on the bank's safeguards to identify a zombie companies (Ahearne & Shinada, 2005, Caballero et al., 2008, Imai, 2016, Hoshi, 2006, Fukuda & Nakamura, 2011, Takasu & Nakano, 2019). However, the research agreed on the most important contents of a zombie companies as follows: "Plant-based businesses" are inefficient businesses with large loans but able to repay debts. Very low wages, unprofitable business, stagnant, can stand on the brink of bankruptcy, the reason exists because loans continue to be "pumped" from banks, with very low interest rates. These "plant-based businesses" increase the market entry costs of young businesses, becoming a burden for the economy.

### 2.1. Research overview on how to identify zombie companies

Research of zombie companies formulate criteria to identify zombie companies in two directions, either measuring based on the loss of profits of mature companies (Adalet McGowan et al, 2017) or anticipation predict future earnings declines from market value of stock market

companies (Banerjee & Hofmann, 2018). Caballero et al (2008) gave the simple criterion to determine zombie companies that they are derived lower interest rate from the banks than other ones in the industry (the average of market interest rate). However, Fukuda & Nakamura (2011) shown that a normal firm may be received lower interest rate or a zombie sometimes accepted the market interest rate in a detail period of time. Therefore, they developed the norm about the profitability criteria of firm.

Studies of Hoshi (2006), Imai (2016), Urionabarrenetxea et al. (2018) relied on analyzing a number of indicators from the financial statements to identify zombies. These companies had the negative value of pledge assets (equity) but they still continued the economic transactions. However, Urionabarrenetxea et al (2018) judged the criteria about the ability of interest rate payment as a good norm but data may not be available. Thus, he proposed replacing this criteria into the ability to pay short - term loans which is reflected in the financial statement or in the balance sheet.

Shen & Chen (2017) argued that, when studying the case studies in China, it was necessary to count the subsidizations and tax reductions of the Government for state zombies because China has many state owned enterprises. They used the actual profit Method (AP) to identify zombie companies. Their analysis is that profit in the financial statements was not necessarily reflected in real profit, because these companies could obtain positive normal profits by financial assistance, tax reduction or other subsidizations. The actual profit was calculated by subtracting the subsidizations and other non- operation income from normal profit. Thus, the determination of zombies will be underestimated if the authors ignore the government supports. If the model of Caballero et al. (2008), Fukuda & Nakamura (2011) focus on whether these "zombie" companies receive extraordinary subsidies from financial institutions and this approach is appropriate for developed countries because of that the allocation of resources is made by the market. However, Shen & Chen (2017) argue that, when studying China, it is important to consider the subsidy and reduction of government tax for zombie companies, since China has many state enterprises. Therefore, Shen & Chen (2017) used the method Actual profit (AP) to determine the "zombie" companies. The AP method emphasizes that corporate profits can not reflect real profits, because they can earn positive nominal returns through financial subsidies, tax

breaks, or gains and other non-recurring losses.

## 2.2. Research overview identification model zombie companies

Currently, researchers as well as managers and policy makers have not agreed on criteria for identifying 'zombie'. Therefore, along with the direction to study the criteria for identifying 'zombie companies', researchers also focus on the model of factors that help identify zombie companies. Research by T. Hoshi (2006) is one of the early researches and quite comprehensive study of Japanese enterprises. The study used a sample of 63 listed companies in Japan, 1997-2001. The author built the Probit model to estimate the factors that affect probability for a business to be classified as a Zombie.

In particular, a business is zombie if the actual interest paid in the year is lower than the minimum required interest rate is  $I_{i,t}^*$

$$I_{i,t}^* = r_t^{short} \times B_{i,t-1}^{short} + \left( \frac{1}{5} \sum_{j=0}^4 r_t^{long} \right) \times B_{i,t-1}^{long} + \min(r_{t-4}^{cb}, \dots, r_t^{cb}) \times$$

$Bond_{i,t-1}$  Including:

- $r_t^{short, long, cb}$ : Short-term / long-term interest rates in year t.
- $B_{i,t}^{short, long, cb}$ : Short term / long term bank loan, year t.
- $Bond_{i,t-1}$ : Issuance of corporate bonds.

If  $I_{i,t} < I_{i,t}^*$ , the enterprise is considered 'zombie', in there  $I_{i,t}$  is actual interest paid.

The research results show that: (i) The 'zombie company' are found more in non-core industries and have their headquarters located outside major urban areas; (ii) 'Zombie companies' tend to have low profitability, a high debt-to-asset ratio and high levels of dependence on banks; (iii) Small business size (size and size of labor), the enterprise is more likely to become a business enterprise, but when the enterprise size is large enough, it is less likely to become a zombie. Criteria for identifying the 'zombie' proposed by T. Hoshi (2006) are more widely known in the paper by published in the American Economic Review. Subsequent studies often use this criterion to identify the 'zombie' as the CHK criterion.

Fukuda & Nakamura (2011) used the CHK criterion to identify zombie companies from listed companies in Japan for the period 1995-2004, with the aim of investigating why zombie companies recovered. in Japan. The study focused on the group of corporate restructuring factors, helping the 'zombie company' to recover. The results of the

study show that restructuring includes staff cuts and the sale of non-useful fixed assets is a positive sign for the resurgence of troubled companies. In addition, increased losses especially support the recovery of zombie companies as it may have improved their accounting transparency. However, the increase in profits especially through the sale of assets is detrimental to the recovery of zombie companies because it can delay the restructuring process. Failure to pay the CEO bonus is ineffective because it can discourage and reduce their motivation. External support including debt reduction and capital reduction are other important factors for the recovery of zombie companies. In addition, the favorable macroeconomic environment in the 2000s played an important role in improving the efficiency of business restructuring.

Continuing research on Japanese business enterprises, Nakamura (2017) has based on Nakamura & Fukuda (2011), Nakamura & Fukuda (2013) research frameworks, while improving the CHK criterion by adding further Two criteria for determining zombies are: (i) Profit criterion: Enterprises are not zombies if they have higher after-tax profit and pay higher interest rates; Low leverage, i.e. less than one-fifth of total non-Zombie assets; (ii) Evergreen lending criteria: According to this criterion, companies that are not profitable, use high financial leverage, and increase external loans are in the 'zombie' category.

Research on Chinese enterprises is also a topic of interest to many scholars and undeniably: Zombie companies have become a major concern in China (Raphael, et al. 2017). Raphael et al. (2017) used enterprise-level survey data for the period 1998-2013 to study the central role of zombies and their close association with business. (SOEs) in contributing to debt gaps and low productivity. Zombie companies and SOEs account for a large share of debt, contributing to debt and facing fundamental weaknesses. To assess the determinants of a business as Zombie or the factors that help identify the 'zombie', this study used the Probit model.

$$Pr(zombie_{it} = 1) = \beta X_{it-1} + DInd + Dyear + Dreg + \varepsilon_{it}$$

- Including:
- $i$ : Index of observation -  $i^{th}$  business
  - $t$ : Time index, denoted year t
  - $zombie_{it}$ : Dependent variable, value is 1 if enterprise  $i$  is zombie in year  $t$  according to research criteria and receives zero value in other cases
  - $X_{it-1}$ : Explain the variables, taking the first

step to avoid the endogenous problems in the regression model

- *Ind* : Dummy sector
- *year* : Dummy variable year

*reg* : Regional / Local variables

Experimental results show that zombie companies tend to be less efficient, that is, they have higher financial leverage and lower profits. The reduction in aggregate demand (due to the average revenue growth in the industry) will contribute to the increase in zombie companies.

The study of the "Zombie company" in Japan and China is a source of inspiration for many recent studies on the "Zombie company" in Europe and the OECD countries in the EU. These studies focus on explaining the existence mechanism of "Zombie company"; Introduce models to draw solutions to restructure "Zombie company" and help "Zombie company" recovery. The study by Manuela et al. (2017) examines the relationship between business and inefficient banks in Europe. Research on the use of data from unlisted small and medium enterprises in seven European countries (Spain, Greece, Ireland, Portugal, Slovenia, Germany and France), 2010-2014.

Also study of European DNPs, McGowan et al. (2017a, 2017b) consider DNPs in OECD countries in relation to productivity; reallocation of resources and bankruptcy. The authors' research uses enterprise-level data in 13 countries and 40 sectors, 2010-2013.

The polynomial logit model is proposed as follows:

$$Status_{it} = \alpha + \sum_j \beta_j^{insol} * Exp_j + \sum_k \beta_k^{pol} * Exp_k + \sum_l \beta_l^X * X_{it-l} + \delta_t + \delta_i + \varepsilon_{it}$$

Including the dependent variable is the Status variable, it receives a value of 1: if a company is classified as zombie in 2010, it becomes non-zombie in 2013 (it is likely to be re-structured back to good); equals 0 if there is no change in status from 2010 to 2013 and -1 if a non-zombie company in 2010 moved to zombie status in 2013.

### 2.3. Research overview influence of zombie companies on the financial efficiency of enterprises

In the study of Caballero et al. (2008) show that plant-living enterprises distort the market by affecting the rate of newly created jobs and job losses. The number of new jobs created by the number of employees increased throughout the year divided by the total number of employees at

the beginning of the year. Similarly, the job loss rate is calculated by the number of employees decreased during the year divided by the total number of employees at the beginning of the year. In addition, the authors' research shows that plant-based businesses reduce the rate of investment and increase the unemployment rate of normal businesses in the same industry. In addition, factory-based businesses have an increasing number of employees compared to conventional businesses, but the unemployment rate is the same (T Hoshi, 2006). Plant-based businesses cause ordinary businesses in the industry to be more severely affected by the economic crisis, and have difficulty obtaining loans.

According to Raphael et al. (2017), zombie companies tend to attract private investment, contributing to productivity gains and competition (Tan et al., 2017; Guo et al., 2017; Ahearne & Shinada 2005; Kwon, Narita and Narita 2009). For example, Tan et al. (2017) found that zombie companies tended to attract non-zombie companies' investment to 2-8%. As a result, they can curb productivity and growth while causing financial risk by increasing nonperforming loans in the financial system.

Jiang et al. (2017) pointed out that the decline in economic growth after China's 30 years of rapid economic growth has made zombie businesses a priority. mind for government action. At the opening ceremony of the fourth session of the 12th National People's Congress, Prime Minister Li Keqiang presented a government work report highlighting the long-term survival of zombies not only accounting for resources. It also causes financial problems to other enterprises and reduces the productivity of the whole industry (Jiang et al. 2017).

In the article by McGowan et al. (2017), the authors show that the existence of weak companies reduces average productivity, but the consequences for growth are even worse. Because the companies lose scarce resources, their long-term survival may increase productivity-related wages, reduce market prices and weaken investment - all deteriorating. The expansion of manufacturing companies, especially startup companies. Findings in the article have strong policy implications; In fact, there are many opportunities to reform bankruptcy policies in many countries and provide evidence that the misallocation of capital and the existence of low-productivity businesses have contributed to slowing productivity.

Caballero et al. (2008) suggest that to keep

unprofitable borrowers (which the authors call zombies) continue to live, banks allow them to distort competition. Deformities of zombies come in many ways, including lowering their market prices, raising market wages, and finding ways to attract markets where they are involved. Increased government responsibility comes from securing banks' deposits to support zombie companies as a very inefficient program to sustain employment. Low product prices and high wages reduce the profits and collateral that newer and more productive companies can create, thus

discouraging their investment.

### 3. Research design

#### 3.1. Data and variable definitions

The study uses secondary data, collected from financial statements of 48 listed real estate companies, period 2008-2016. The data of 2008-2010 is used to identify the 2010 zombie companies, so the data is in the regression models for the period 2010-2016.

The variables used in the study are described in detail in Table 1.

Table 1. Definitions of variables

Variable name	variable sign	variable definitions
Zombie companies	Zombie (ZC)	Dummy variable that takes the value 1 if the firm is a zombie company. A company is classified as a zombie company in a year if company with negative profits and its Interest Coverage Ratio = EBIT/Interest Payments is less than one for three consecutive years, takes the value 0 in otherwise.
Return on total assets	ROA	Return / total assets
Return on equity	ROE	Return / equity
Company size	SIZE	Ln of total assets
Revenue growth rate	GR	(Revenue t – Revenue t-1)/ Revenue t-1
Financial leverage	DTL	Total liabilities / total assets
Change in total assets	DA	Ln of total assets in year t subtract Ln of total assets in year t-1
Cash payment ratio	MR	Cash and cash equivalents / Short-term liabilities
Current Ratio	CR	Current assets / short-term liabilities
Asset Turnover Ratio	ATR	Net revenue / average total assets

Source: Research results of the authors

#### 3.2 Test model

To answer the research questions posed, the authors conducted two groups of regression models and selected appropriate estimation methods.

*The model identifies the factors that help identify zombie companies*

To identify the factors that help determine zombie companies, the authors use the Probit model with the following array data:

$$P(\text{zombie}_{it} = 1) = \alpha_0 + \alpha_1 \text{SIZE}_{it} + \alpha_2 \text{ATR}_{it} + \alpha_3 \text{ROA}_{it} + u_{it} \quad (1)$$

Including: on the left side of the model (1) is the probability that a listed company in the real estate industry will become a zombie company in the research period. The right side includes explanatory variables:

$\text{SIZE}_{it}$  is the logarithm of total assets, it represents the capital size of the business. Hypothesis: The bigger the size of a business, the less likely it is that a business becomes a zombie.

$\text{ATR}_{it}$  The asset turnover ratio calculates net sales as a percentage of assets. This ratio shows how efficiently a company can use its assets to

generate sales.

$\text{ROA}_{it}$  is the return on total assets. Demonstrate financial performance of the business. It is hypothesized to have an adverse effect on the ability to become a state-owned enterprise.

$u_{it}$  is a random error.

$\alpha_k$  is the regression coefficient in the model.

*Model assessing the impact of real estate businesses on the real estate industry on the performance of enterprises in the industry*  
 $Y = F(\text{zombie}, X)$

Dependent variable Y is the business performance, measured by return on total assets (ROA). independent variables: zombie is dummy.

X is a control variable vector that includes factors that affect business performance that have been used in many previous studies such as: enterprise size (SIZE); revenue growth rate (GR); Total asset turnover (ATR); financial leverage (DTL); cash ratio (MR); Current payment rate (CR). These variables are explained in Table 1.

Specific regression models as follows:

$$ROA_{it} = \beta_0 + \beta_1 zombie_{it} + \beta_2 SIZE_{it} + \beta_3 GR_{it} + \beta_4 ATR_{it} + \beta_5 DTL_{it} + \beta_6 MR_{it} + \beta_7 CR_{it} + v_i + u_{it} \quad (2)$$

where  $i$  = real estate sector listed company ( $i = 1, \dots, 48$ ) and  $t$  = time (from 2010 to 2016).  
 $ROA_{it}$  are the dependent variables (DV);  
 $X_{it}$  represents one independent variable (IV);  
 $\beta_i$  is the coefficient for that IV;  
 $v_i$  is the unknown intercept for each company (48 companies -specific intercepts);  
 $u_{it}$  is the error term.

### 3.3 Method of estimation

The model to determine the factors that help determine zombie companies (Model (1)) is estimated according to the Probit data array model with random effects.

The process of estimating model (2) is as follows:

Initial estimation model (2) based on array data, with random effects (REM).

Breusch and Pagan tests see if there are any differences in the array.

If there is no difference in the array, then select the POLS model.

If there are differences in the array, estimate the

fixed impact model (FEM) and the random impact model (REM), using the Hausman test to select the REM or FEM model.

Check the assumptions of the selected model and correct any errors if there are any.

## 4. Empirical results

### 4.1. Characteristics of zombie listed companies in the real estate sector

The rate of zombies in the real estate industry: by definition of zombies, the companies have a negative profit from production and business activities and the interest rate coverage for three consecutive years is less than 1. Accordingly, the rate of zombies in the period of 2010-2016 from 0% - 32.65%, the lowest rate of zombies was 0% in 2010, this rate increased sharply to a peak of 32.65% in 2013, the following year the rate of zombies decreased but still higher than that of period before 2013. This is quite consistent with the macroeconomic situation of Vietnam in this period. Specifically, the period 2010-2014 was a post-crisis period, saving interest rates increased, businesses had demand for loans, and many businesses declared bankruptcy. Debts from the previous three-year period were the main reason for the higher zombie prevalence in 2013-2016.

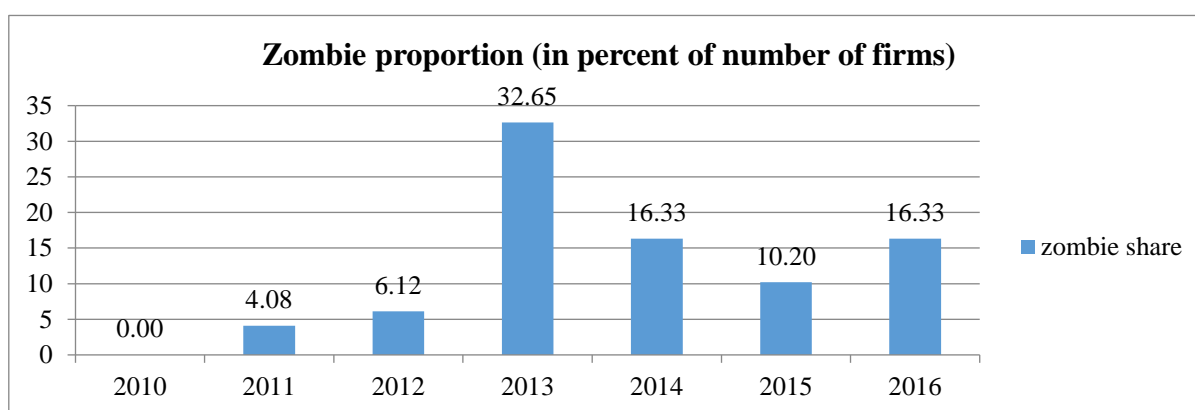


Figure 1. Zombie proportion (%) (2010 – 2016)

Source: Research results of the authors

### Active performance of zombies

Table 2. Testing of differences in average values of variables group of zombie and healthy companies, 2010-2016

	N	ROA	ROE	SIZE	ATR	CR	DTL	MR	GR
non zombie	301	0.0382	0.0819	14.2992	0.3207	2.3488	0.5260	0.9148	0.7016
zombie	42	-0.0571	-0.1505	13.8654	0.1629	1.8712	0.5878	0.4579	0.2333
diff		0.0953 ***	0.2324 ***	0.4338 **	0.1578 ***	0.4776 **	-0.0618	0.8589	0.4682
P(T > t)		(0.0000)	(0.0001)	(0.0213)	(0.0001)	(0.0462)	(0.9739)	(0.1654)	(0.1515)

Source: Research results of the authors

(The numbers in parentheses indicate the probability level; \*\*\*, \*\*, \* indicate the level of

statistical significance respectively 1%, 5%, 10%).

T - test results show that the average values of

ROA, ROE, ATR of healthy companies are higher than those of zombie companies with 1% significance level; The average value of the scale (SIZE), Current Ratio (CR) of healthy companies are all 5% higher than those of zombie companies.

## 4.2. Regression analysis

### 4.2.1. Key determinants of zombie companies in the real estate sector

Model estimation results (1) in Table 3

Table 3. Model estimation results (1)

zombie	Coef.	Std. Err.	z	P>z	[95% Confidence interval]	
SIZE	-0.2002	0.0868	-2.3100	0.0210	-0.3703	-0.0301
ATR	-1.3275	0.6015	-2.2100	0.0270	-2.5064	-0.1487
ROA	-10.2547	1.7228	-5.9500	0.0000	-13.6313	-6.8781
_cons	1.8625	1.2821	1.4500	0.1460	-0.6505	4.3754

Source: Research results of the authors

The estimation results show that financial leverage (DTL = total debt to total assets) has the potential to motivate enterprises to become enterprises. This result is consistent with such theories: the trade-off theory; the agency theory. These theories indicate that: disadvantage of financial leverage be the potential costs associated to bankruptcy. When financial leverage increases, the company increase the risk of liquidation.

Obviously, when increasing the debt on the total assets that the company is inefficient, the profit is not enough to pay interest, leading to a higher risk of becoming a zombie.

Conversely, if the company is doing well, ROA increases, the risk of becoming a zombie will decrease.

In addition, the capital structure (DA = the change in total assets) has the ability to reduce the

risk of firms becoming zombies.

### 4.2.2. The impact of zombie companies on financial performance

Before regression analysis, the authors conduct pair-correlation analysis between variables in the model to detect linear relationships between variables, thereby having a model estimation strategy to overcome the multi-collinear phenomenon. in the regression model.

The correlation analysis results in Table 4 show that: Zombie variable has a negative correlation coefficient with the variables SIZE, ATR, CR and positively correlated with the DTL variable ROA is negatively correlated with zombie variables, DTL and positively correlated with variables GR, ATR, MR, CR.

Table 4. Pearson correlation coefficient between pairs of variables in the model (2)

	ROA	zombie	SIZE	GR	ATR	DTL	MR	CR
ROA	1.0000							
zombie	-0.4203 (0.0000)	1.0000						
SIZE	-0.0140 (0.7961)	-0.1096 (0.0426)	1.0000					
GR	0.4155 (0.0000)	-0.0558 (0.3029)	-0.0452 (0.4037)	1.0000				
ATR	0.3132 (0.0000)	-0.1982 (0.0002)	-0.2980 (0.0000)	0.0451 (0.4051)	1.0000			
DTL	-0.2186 (0.0000)	0.1049 (0.0522)	0.1939 (0.0003)	-0.0947 (0.0797)	0.0309 (0.5684)	1.0000		
MR	0.3082 (0.0000)	-0.0527 (0.3309)	-0.0394 (0.4669)	0.5206 (0.0000)	0.0218 (0.6872)	0.0439 (0.4174)	1.0000	
CR	0.1095 (0.0427)	-0.0910 (0.0924)	0.0620 (0.2518)	0.0458 (0.3975)	-0.2375 (0.0000)	-0.0829 (0.1255)	0.0757 (0.1620)	1.0000

Source: Research results of the authors with STATA software

(Numbers in parentheses indicate probability level)

Breusch and Pagan test results show that model

(2) does not exist any difference in arrays. Therefore, continue to estimate according to the gross data model (POLS). The results of the



estimation test show that the model has no multicollinearity and the variance of errors varies.

**Table 4.** Model estimated results (2)

Variable	MH1	MH2
zombie	-0.0680*** (0.0000)	-0.0635*** (0.0000)
SIZE	0.0051* (0.0508)	0.0055** (0.0335)
GR	0.0080*** (0.0000)	0.0084*** (0.0000)
ATR	0.0841*** (0.0000)	0.0864*** (0.0000)
DTL	-0.0702*** (0.0000)	-0.0757*** (0.0000)
MR	0.0035*** (0.0060)	0.0036*** (0.0049)
CR	0.0047** (0.0126)	0.0047** (0.0113)
zombie*GR		-0.0142** (0.0254)
_cons	-0.0442 (0.2483)	-0.0487 (0.2018)
R-squared	0.4337	0.4421
Number of obs	343	343

Source: Research results of the authors

(Numbers in parentheses indicate probability level, symbols \*\*\*, \*\*, \* indicate significance level of 1%; 5%; 10% respectively)

Estimated model results (2) with the dependent variable ROA show that:

With a 1% significance level, the authors can conclude: Zombie companies are less efficient in production and business (measured by ROA) than other healthy companies.

In addition, control variables that have a positive impact on ROA include firm size (SIZE); revenue growth (GR); total asset turnover (ATR); Cash ratio (MR); Current payment rate (CR).

These variables have been used in many studies on the factors affecting financial performance and are also explained by a number of theories such as:

Particularly, the DTL variable represents the company's leverage, which has a negative impact on ROA. This can be explained by: When financial leverage increases, the company increase the risk of liquidation which could affect the management personally and financial performance (Berger & Patti, 2004).

To consider the interaction effects between zombies with other variables, MH2 introduces additional interaction variables between zombies and revenue growth (GR). The MH2 estimation results show that: with a 5% significance level, the

revenue growth of zombie companies has a negative impact on the average value of ROA that represents the financial performance of the business.

### Conclusions

This study looked at zombie characteristics, zombie determinants and the effects of zombies on the performance of businesses listed in Vietnam's real estate industry in the period 2008-2016. The study used the definition: A company is classified as a zombie company in a year if company with negative profits and its Interest Coverage Ratio = EBIT/Interest Payments is less than one for three consecutive years.

Finally the research found that: (i) during the research period, the highest rate of zombies in real estate listed companies was 32.65% in 2013; (ii) Zombie companies has been lower financial performance (ROA, ROE) than healthy companies, and healthy companies also have current solvency and total assets turnover higher than zombie companies; Zombie companies tend to be smaller in scale than healthy companies; (iii) to reduce the risk of becoming a zombie, companies should expand capital scale, increase total asset turnover and increase production and business efficiency; (iv) zombies and revenue growth of zombies have a negative effect on the performance of the whole industry and thus negatively affect the economy.

From the results of this empirical study, the authors propose a number of recommendations:

Businesses need to develop a development strategy, an operation plan in which attention should be paid to factors that help businesses stay away from the risk of becoming zombies and improve the efficiency of production and business activities. Specifically: businesses should expand capital scale, increase total assets turnover; improve solvency; reduce leverage. This contributes to promoting the efficiency of production and business activities and reducing the risk of becoming zombies.

For regulators and policy makers: Investment projects on in-depth research on zombies in Vietnam are needed to gain more insight into the situation of zombies. The empirical research results are the basis for policy makers to take measures to address the zombie situation in the economy.

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