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A Test of the Life Cycle Theory of Dividends and the Effect of a Financial Crisis

- Evidence from Sweden

by

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Abstract

Title	A Test of the Life Cycle Theory of Dividends and the Effect of a Financial Crisis - Evidence from Sweden
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Authors	Amalia Major Fredrik Ångbäck
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Key words	Life cycle theory of dividends, dividend policy, dividend payout, financial crisis, logit model
Purpose	The purpose of this study is to test the life cycle theory of dividends, and to investigate if the most recent global financial crisis had an impact on dividend payout and the life cycle determinants in Sweden
Methodology	The study is performed using a deductive approach. Logit model regressions are done in Eviews to analyse the secondary data retrieved from Datastream.
Theoretical perspectives	The foundation of the study is the life cycle theory of dividends. Other theories that are commonly used to explain dividend policy are also described, including the catering theory of dividends, the dividend smoothing model, and the signalling theory. Previous research regarding the life cycle theory of dividends is also used.
Conclusions	The study finds that the life cycle theory of dividends has partial support in Sweden, as three out of four life cycle determinants shows predicted and significant relationships with dividend payout. Further, it finds that the financial crisis negatively affected dividend payout among Swedish firms, and that the life cycle determinants did not change due to the financial crisis.

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1 Introduction

In this chapter, the background and problem discussion are presented in order to motivate the purpose of the study. Thereafter, research limitations and a short description of the study's outline are provided.

1.1 Background

The management of a firm has two very important decisions to make on a regular basis - investment decisions and financing decisions (Baker and Powell, 2005). One part of a firm's financing decisions concern dividend decisions and therefore dividend policy, which "...refers to the payout policy that a firm follows in determining the size and pattern of cash distributions to shareholders over time." (Baker, 2009). Since dividend payouts will decrease the amount of earnings a firm retains and reinvests, it will affect financing and investment decisions. This implies that these decisions - investment, financing, and dividend - all affect each other, and it is very important, and also difficult, to balance them (Baker, 2009).

During the recent decade, a lot of research has been conducted on the topic of dividend policy (Denis & Osobov (2008); Hoberg & Prabhala (2009); Renneboog & Trojanowski (2011); Thanatawee (2011); Coulton & Ruddock (2011); Ali & Urcan (2012); El-Ansary & Gomaa (2012); Kale et al. (2012); Lambrecht & Myers (2012); Kouser et al. (2015)). This is due to the complexity of dividends, also referred to as the "dividend puzzle", an expression coined by Black in 1976. For example, in 1961, Modigliani and Miller developed the dividend irrelevance theorem, which suggests that dividend decisions are irrelevant in perfect capital markets and can be ignored if the firm makes reasonable investment decisions. Since then, many other theories have been developed. The signalling theory introduced by Lintner in 1956 and developed by others afterwards, states that a firm distributes dividends to send signals of the firm's wellbeing to the capital markets. In 1972, Mueller proposed the life cycle hypothesis of dividends, which suggests that a firm's dividend policy should be determined based on where it is in its life cycle. The hypothesis has later been recognized as a theory since it has been extensively tested and investigated by other authors (Fama & French, 2001; Grullon et al., 2002; DeAngelo et al., 2006;

Denis and Osobov, 2008; Thanatawee, 2011; Coulton & Ruddock, 2011; El-Ansary & Gomaa, 2012; Kouser et al., 2015). The catering theory, developed by Baker and Wurgler (2004), suggests that firms cater investors with dividend payouts when investors put a premium on dividend paying stocks. Even more theories have been developed trying to explain dividend payouts, but still the topic is puzzling to many investors and academics (Baker & Weigand, 2015).

The crash of the investment bank Lehman Brothers in 2008 made the most recent global financial crisis reach a new level of severeness due to lack of confidence in corporations' creditworthiness, and affected the world economy through interlinkages between sectors and countries (Financial Crisis Inquiry Commission, 2011). In Sweden, GDP fell by more than five percent in 2009, exports decreased dramatically, and corporations suffered (Statistiska centralbyrån, 2017, translated). It also got increasingly more difficult and expensive for corporations to get loans (Riksbanken, 2012, translated). In line with Baker and Powell's (2005) argumentation for investment and financing decisions, the increased difficulty in receiving external financing should have affected firms' financing and investment decisions, and therefore dividend decisions in form of decreased dividend payouts.

1.2 Problem discussion

Historically, a financial crisis is a recurring event (Colander et al., 2009), and is therefore interesting to investigate. The crisis of 2008 affected the financial systems globally, thus affecting financing, investment, and dividend decisions of corporations, and this caused a large number of distressed firms, still affecting the economy (Allen & Elliot, 2016). In 1990, DeAngelo and DeAngelo investigated the relationship between dividend payouts and financially distressed firms and found that managers of large public firms respond to financial distress with quick and aggressive dividend reductions. Campello et al. (2010) surveyed 1,050 Chief Financial Officers (CFO) in the United States, Europe and Asia during the financial crisis in 2008, and found that the inability to borrow externally caused many firms to bypass attractive investment opportunities. They also showed that constrained firms were forced to burn a substantial portion of their cash savings during the crisis and had to cut more deeply in their planned dividend distributions (Campello et al., 2010). In a more recent study, Bliss et al. (2015) state that, in particular, firms that

are most vulnerable to shocks in the cost of external funds are the ones making drastic cuts in their payouts. Hence, payout reductions can be perceived as a substitute form of financing (Bliss et al. 2015).

Until recently, many dividend policy studies have focused on explaining the signalling theory, the catering theory of dividends, and the dividend smoothing model. However, several of these studies' empirical findings contradict what the theories predict, hence no single dividend theory has become the leading solution to the dividend puzzle (Baker et al., 2011). For example, Benartzi et al. (1997) and Grullon et al. (2002) test the signalling theory and find that the earnings' growth rate does not increase after a dividend increase, as the theory predicts it should (Lintner, 1956). Furthermore, Julio and Ikenberry (2006), Denis and Osobov (2008), Hoberg and Prabhala (2009), and Rennebog and Trojanowski (2011) all find results contradicting the catering theory of dividends.

In 2001, Fama & French wrote an interesting paper stating that firms are becoming less prone to pay dividends. In their research, the proportion of dividend payers listed on NYSE, AMEX, and NASDAQ, fell from 66.5% in 1978 to 20.8% in 1999. DeAngelo et al. (2004) clarified Fama & French's results, stating that dividends as an amount is not declining, but rather the number of dividend paying firms, meaning that dividend payouts are highly concentrated. The combination of fewer dividend paying firms and a higher amount of dividend payouts is in line with the life cycle theory of dividends, first proposed by Mueller (1972). It predicts that mature firms, which are assumed to be large, profitable firms with few profitable investment opportunities, should pay out dividends to a larger extent than young firms, which is strengthened by the findings of Fama and French (2001) and DeAngelo et al. (2006).

According to Baker (2009), the recent interest in the life cycle theory of dividends could possibly be explained by the study on dividend payment behaviour conducted by Fama and French (2001). Thereafter, Grullon et al. (2002), DeAngelo et al. (2006), Denis and Osobov (2008), Thanatawee (2011), Coulton and Ruddock (2011) and Floyd et al. (2015), among others, have presented studies supporting the theory.

Even though the life cycle theory of dividends and its determinants explaining dividend policy has a wide support in earlier research (Grullon et al. (2002); Denis & Osobov (2008); Thanatawee (2011); Coulton & Ruddock (2012); El-Ansary & Gomaa (2012)), no study has yet been conducted to specifically test the life cycle theory of dividends on Swedish firms. The studies conducted in Sweden have focused more on investigating the determinants of dividend policy in a general context, trying to find support for multiple theories (Johansson & Ladan, 2014; Ringborg & Dai, 2016). Similarly, the studies regarding the financial crisis and dividend policy conducted by Campello et al. (2010) and Bliss et al. (2015), have mainly focused on dividend policy changes in a general context and not specifically used a single theory framework. Consequently, studies made on how the determinants of the life cycle theory of dividends changed due to the financial crisis are limited. A study by Kouser et al. (2015) is one of very few, and therefore we want to emanate from their study, and investigate if the life cycle theory of dividends can explain Swedish firms' dividend policy, and how the determinants of this theory changed due to the financial crisis in 2008.

1.3 Purpose

The purpose of this study is to test the life cycle theory of dividends, and to investigate if the financial crisis had an impact on dividend payout and the life cycle determinants in Sweden.

1.4 Research Questions

To fulfil the purpose of this study, we want to answer the following questions:

1. Do the determinants of the life cycle theory of dividends determine dividend payout in Sweden?
2. Did the financial crisis affect dividend payout of Swedish firms?
3. Did the financial crisis have an impact on the relationship between dividend payout and the determinants of the life cycle theory of dividends?

1.5 Research Limitations

The study will investigate non-financial firms with dividend payouts, listed on Nasdaq Stockholm during 2004-2012. The study will use a logit model to investigate the significance of the life cycle determinants profitability, size, investment

opportunities, and earned/contributed capital mix. The included control variables are lagged dividend payout, profitability lagged one year, cash holdings, and total equity to total assets. Furthermore, the study incorporates year dummies for the financial crisis years 2007-2009, and an interaction variable for the period after the crisis.

1.6 Framework of Thesis

Chapter 1 – Introduction	In this chapter, the background and problem discussion are presented in order to motivate the purpose of the study. Thereafter, research limitations and a short description of the study's outline are provided.
Chapter 2 – Theoretical Foundation and Literature Review	In this chapter a theoretical framework is presented. After an introduction of the theoretical foundation, the life cycle determinants' expected relationships to dividend payout are given. Thereafter, three hypotheses are developed which the study aims to test. A literature review will end the chapter.
Chapter 3 – Method	In this chapter the research approach is presented as well as the procedure of data collection and the treatment of it. All variables used to construct the regressions are introduced and defined. Thereafter, four regression models that will be used to perform the study are presented and explained. The chapter will end with a review of the study's validity and reliability.
Chapter 4 – Results	In this chapter the results of the study are presented. The descriptive statistics are presented first, and thereafter the output of the four regression models. Regressions 2-4 are presented along with tests of the hypotheses. The chapter ends with a presentation of the model diagnostics.
Chapter 5 – Analysis & Discussion	In this chapter the results are analysed and discussed using the life cycle theory of dividends and previous research. This will be done for all of the study's research questions.
Chapter 6 – Conclusion	In this chapter a conclusion is drawn from the results and analysis. Further, we attempt to clarify how the results are contributing to the existing knowledge regarding dividend policy, and how the findings can be generalised and used in the future. The chapter ends with a few suggestions regarding further research on the topic.

2 Theoretical Foundation and Literature Review

In this chapter a theoretical framework is presented. After an introduction of the theoretical foundation, the life cycle determinants' expected relationships to dividend payout are given. Thereafter, three hypotheses are developed which the study aims to test. A literature review will end the chapter.

2.1 Theoretical Framework

The life cycle theory is based on agency problems, and therefore we will first introduce the agency theory as explained by Jensen and Meckling (1976), Rozeff (1982), and Jensen (1986). We will then present the life cycle theory of a firm and the related dividend hypothesis, as given by Mueller (1972). Further, we will explain the important validation regarding this hypothesis made by Fama and French (2001), and also the developments of it, made by DeAngelo et al. (2006). Thereafter, we will present the predicted relationships between the life cycle determinants and dividend payout according to theory, followed by the hypotheses, developed to fulfil the purpose of this study. The chapter will end with a literature review, which has three different focuses:

1. First, we will present studies supporting the life cycle theory of dividends to clarify the findings of earlier research. We will end by presenting some criticism to enhance the awareness of the weaknesses of the theory. Even though the life cycle theory of dividends has been around for some time, criticism towards the theory is somewhat lacking. We still manage to find some differing opinions and ambiguous results.
2. Second, we will present two studies with a focus on dividend policy in Sweden. Since this field is not extensively investigated, this part of the literature review will be based on unpublished research.
3. Last, we will briefly present the catering theory of dividends, the dividend smoothing model, and the signalling theory, which all are used to explain dividend policy. By describing these three theories, we want to make clear what distinguishes the life cycle theory of dividends from them.

2.2 Theoretical Foundation

2.2.1 Agency Theory

Jensen and Meckling (1976) emphasizes the importance of the contract between owners and managers of the firm, i.e. the principals and the agents, respectively, since it is these contracts that stipulates what kind of behaviours and relationships that should exist between the two parties. Due to the separation of ownership and control, it is likely that the agents will not always act in the best interest of the principals, i.e. cause an agency problem, which in turn will cause agency costs since the agency problems will have to be controlled by the principals. Monitoring efforts and incentive alignment are the main control mechanisms the shareholders have to control management (Jensen and Meckling, 1976).

Rozeff (1982) finds that a firm's dividend policy is influenced by agency costs. When a firm pays out dividends, it reduces the agency costs of managerial discretion, since the funds available to management decreases. At the same time, an increase in dividend payout increases the transaction costs of external financing, thus an optimal dividend payout level minimizes the costs of the two factors (Rozeff, 1982).

Jensen (1986) establishes the agency theory of free cash flow, which to a large extent is an elaboration of Rozeff's conclusions from 1982. Jensen (1986) argues that agents have incentives to overinvest to increase their personal power, and to reduce this agency problem, dividends can be used. Moreover, Jensen recognizes the problem that can occur with dividend payments, as management influences the decision of a dividend payout. Thus, management controls free cash flows, and there will always be a risk that the dividend payout level will have to be reduced (Jensen, 1986).

2.2.2 The Life Cycle Theory of Dividends

Mueller (1972) establishes the life cycle theory of firms, and develops a hypothesis from this theory concerning dividend payout, suggesting that a firm's dividend policy should depend on where it is in its life cycle. Young firms should reinvest their earnings to be able to grow and realize investment opportunities and decrease uncertainty. This is in line with what shareholders should want, since they want to

own shares in firms that can make profit with competitive, and in the longer run, profitable products. When the market starts to become saturated and competition increases, the profitable investment opportunities will decline. At this point in time, the mature and large firm is likely to have a substantial cash flow from earlier successful and profitable investments, and therefore, mature firms should pay out dividends to its shareholders (Mueller, 1972).

In his research, Mueller (1972) also notices that it is highly likely that managers of a firm might not act as described above, i.e. not in a way that maximizes shareholder welfare. This is related to the agency theory that expects managers to want their firm to grow, since their salary and power is positively related to firm size. Thus, management might not pay out enough dividends to shareholders, and at the same time, spend too much on investments that do not generate sufficient returns (Mueller, 1972).

In the initial phase of a firm's life cycle, the agency problems are likely to be absent since management's incentives are expected to be aligned with shareholders' interests. This is because the amount of profitable investment opportunities will be large, inclining profit and growth (Mueller, 1972). Also, since the internally generated earnings are likely to be too low to pursue all investment opportunities, the corporation will have to get financing from external markets, meaning that management will be monitored (Baker, 2009). And last, the manager of the small, growing firm is likely to have a substantial amount of shares in the firm, thus aligning his or hers interests with other shareholders' (Mueller, 1972).

When the firm reaches a mature state, agency problems are more likely to be present. In this stage of the life cycle, management of the firm should start to distribute earnings to shareholders, and eventually, when all profitable investment opportunities have ceased to exist, management should liquidate all assets and distribute them to the shareholders. It is likely that this will not happen, thus an agency problem has occurred where the management will continue to invest in unprofitable investments, only to keep the firm growing even further, hence increasing their personal wealth and power at the expense of shareholders' welfare (Mueller 1972).

Fama and French (2001) accept the hypothesis developed by Mueller (1972) when they investigate the decline in dividend payers between the years 1972-1999. They find that dividend paying firms have higher profitability than nonpayers, nonpaying firms have the best investment opportunities, and dividend payers are much larger than nonpayers (Fama and French, 2001). DeAngelo et al. (2006) further approve these results when introducing the life cycle determinant earned/contributed capital mix, which is measured by retained earnings to total equity. They test this determinant since they believe it is a good life cycle proxy, as it measures to what extent a firm relies on internally generated and external capital. They find support for their hypothesis that firms with relatively high retained earnings as a proportion of total equity are more likely to pay dividends, which is likely for mature firms. This implies that firms relying more on externally contributed capital should pay less dividends, which is more likely for younger firms. On the other hand, they expect that firms with large cash holdings should pay more dividends, but their results imply the opposite. Their proposed explanation for this is that cash holdings is a less reliable life cycle-proxy, since a firm's cash holdings could be explained by proceeds from e.g. a recent equity offering, which is more likely for a young firm, i.e. a firm paying less dividends (DeAngelo et al., 2006).

2.3 Expected Relationships between the Determinants of the Life Cycle Theory of Dividends and Dividend Payout

The life cycle theory of dividends expects the following relationships between dividend payout and the life cycle determinants:

2.3.1 Profitability

The theory suggests that firms with high profitability are more mature, and therefore should pay out more dividends to the owners (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006).

2.3.2 Investment Opportunities

The theory suggests that firms with large investment opportunities are younger, and therefore should pay out less dividends to the owners (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006).

2.3.3 Size

The theory predicts that larger firms are more mature, and therefore should pay out more dividends than small firms (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006).

2.3.4 Earned/Contributed Capital Mix

The theory predicts that firms with a large amount of retained earnings to total equity should be more mature and therefore pay out more dividends (DeAngelo et al., 2006).

	Profitability	**Investment Opportunities**	**Size**	**Earned/Contributed Capital Mix**
Mueller (1972)	+ Positive	- Negative	+ Positive	
Fama & French (2001)	+ Positive	- Negative	+ Positive	
DeAngelo et al. (2006)	+ Positive	- Negative	+ Positive	+ Positive

Table 1: Predicted relationships between dividend payout and life cycle determinants

2.4 Hypotheses

The purpose of this study is to test the life cycle theory of dividends, and to investigate if the financial crisis had an impact on dividend payout and the life cycle determinants in Sweden. Since the expected relationships between dividend payout and the life cycle determinants are now defined in the theoretical foundation, and the possible implications of a financial crisis has been introduced in the problem discussion, we formulate the following hypotheses to be able to fulfil the purpose of this study:

Hypothesis 1

H_0: The life cycle theory determinants do not determine dividend policy in Sweden

H_1: The life cycle theory determinants determine dividend policy in Sweden

Hypothesis 2

H_0: The financial crisis did not affect dividend payout of Swedish firms

H_1: The financial crisis affected dividend payout of Swedish firms

Hypothesis 3

H_0: The life cycle theory determinants' relationship to dividend payout did not change due to the financial crisis.

H_1: The life cycle determinants' relationship to dividend payout changed due to the financial crisis.

2.5 Literature Review

To be able to further analyse the results that will be produced when testing the above presented hypotheses, we will now present studies related to the life cycle theory of dividends and studies made on dividend policy in Sweden. The chapter will end with a presentation of three theories other than the life cycle theory of dividends, which are commonly used to explain dividend policy.

2.5.1 Empirical Findings Supporting the Life Cycle Theory of Dividends

When examining the dividend announcements of firms listed on NYSE and AMEX between 1967 and 1993, Grullon et al. (2002) find that for dividend-increasing firms, the systematic risk significantly declines around the decision to increase dividends,

and they refer to the life cycle theory as the maturity hypothesis, which they find to be best suited to explain this result. As a growing firm eventually becomes mature, it has fewer growth options, and the assets in place then have a bigger role in determining its value, which leads to a decline in systematic risk. As investment opportunities decline, so do need for capital. The drop in capital expenditures leads to higher free cash flow. Therefore, according to the maturity hypothesis, an increase in dividends is signalling declining investment opportunities and declining systematic risk (Grullon et al., 2002).

Denis and Osobov (2008) examines the propensity to pay dividends in several developed financial markets, such as the United States, Canada, the United Kingdom, Germany, France, and Japan over the period 1989–2002. Specifically, they investigate whether the characteristics of dividend payers and nonpayers are common across countries and if these change over time. Denis and Osobov (2008) find that the likelihood of paying dividends is associated with firm size, growth opportunities, and profitability, just like Fama and French (2001) did. Furthermore, they find that retained earnings to total equity is strongly connected to the probability of paying dividends, which is in line with the findings of DeAngelo et al. (2006). Also, Denis and Osobov (2008) are the first to conclude that there is much support for the life-cycle theory in an international context.

In order to test the life cycle theory of dividends and free cash flow hypothesis, Thanatawee (2011) examines dividend policy of Thai listed firms over the period 2002-2008. The findings confirm that larger and more profitable firms with greater free cash flows and retained earnings to equity tend to pay higher dividends. Size and profitability both have significant positive relationships with dividend payouts and therefore, the findings of Thanatawee (2011) provide much support for the life-cycle theory.

Coulton and Ruddock (2011) test whether the life-cycle theory explains Australian corporate payout policies. Their empirical evidence strongly supports the life cycle theory of dividends. In particular, they find evidence that firms paying dividends are larger and more profitable, have less growth options and higher retained earnings than non-dividend paying firms.

El-Ansary and Gomaa (2012) test the life cycle theory of dividends on the Egyptian market, examining a sample of 100 firms during the period 2005-2010. They find that retained earnings to total equity and profitability have a significant positive effect on dividend payouts. This provides evidence for the existence of the life cycle theory of dividends in Egypt.

Kouser et al. (2015) study the impact of the financial crisis in 2008 on dividend payout policy, using the life cycle determinants. Their sample consists of 285 non-financial firms listed at the Pakistani (Karachi) stock exchange and is analysed during the period 2001-2011. They find that at the time of the financial crisis (2007-2009), firms used a conservative strategy and focused more on retaining cash instead of distributing dividends. The variables profitability, size and investment opportunities relationships to the probability to pay out dividends did change significantly due to the financial crisis. Therefore, the study concludes that firms' dividend paying decision depends not only on the firm's stage in the life cycle, but also on the financial position of the firm. The predicted relationships by Mueller (1972), Fama and French (2001) and DeAngelo et al. (2006) concerning dividend payout and size, profitability, investment opportunities and earned/contributed capital mix are supported by the findings of Kouser et al. (2015).

Author & year	Country	Time Period	Findings
Grullon et al. (2002)	US	1967-1993	When firms increase their dividend payout level, they are signalling declines in systematic risk, profitable investment opportunities and capital needs.
Denis & Osobov (2008)	US, Canada, UK, Germany, France, Japan	1989-2002	The likelihood of paying dividends is associated with firm size, growth opportunities, and profitability. Retained earnings to total equity has a strong connection to the probability of paying dividends. Find that the life cycle theory of dividends has much support in an international context.
Thanatawee (2011)	Thailand	2002-2008	Large, profitable firms with high free cash flow and retained earnings to equity pay higher dividends than others.
Coulton & Ruddock (2011)	Australia	1993-2004	Firms paying dividends are large, more profitable firms, with less growth options and higher retained earnings than others.
El-Ansary & Gomaa (2012)	Egypt	2005-2010	Retained earnings to total equity and profitability have a significant positive relationship with dividend payouts.
Kouser et al. (2015)	Pakistan	2001-2011	During the financial crisis, firms use a conservative strategy and focus more on retaining cash than distributing dividends. Firms' dividend paying decision depends not only on the firm's stage in the life cycle, but also on the financial position of the firm.

Table 2. Summary of Empirical Findings Supporting the Life Cycle Theory of Dividends

2.5.1.2 Criticism Towards the Life Cycle Theory of Dividends

As mentioned, Grullon et al. (2002) found that the systematic risk of firms declines when the decision to increase dividends is taken. However, Bulan et al. (2007) investigates the timing and significance of dividends initiations in the life cycle of a firm, and do not find this risk-signalling feature of the life cycle theory of dividends, thus the results are ambiguous.

Furthermore, the results by Denis and Osobov (2008) are not entirely consistent with the life cycle theory of dividends. Although most variables show the predicted relationship with the probability of dividend payments, one of the most important variables, growth opportunities, does not show the predicted relationship in Germany, France, and Japan. The results incline that dividend paying firms have

better growth opportunities, thus contradicting the life cycle theory of dividends (Denis and Osobov, 2008). Thanatawee (2011) found the same result in Thailand. Another ambiguous result was found by El-Ansary and Gomaa (2012) in Egypt. Their results showed no significant relationship between firm size and dividend payout.

2.5.2 Studies with a focus on dividend policy in Sweden

Johansson and Ladan (2014) investigate firms listed on Nasdaq Stockholm's large and mid caps, and what the determinants are for these firms' dividend payout ratios. They collect data for 2007-2012 and include the determinants cash flow, profitability, size, stock repurchase, ownership concentration and leverage. They find that only profitability and ownership concentration have a significant relationship with dividend payout ratio, and both of these relationships are negative. This was not expected, and they argue that it could be explained by the different reasoning firms have during a financial crisis, i.e. that firms tend to hold on to funds in times of uncertainty.

Ringborg and Dai (2016) investigate which determinants influences the dividend policy of firms listed on Nasdaq Stockholm. They specifically study the determinants size, leverage, profitability, liquidity and investment opportunities during 2010-2015. Among these, size, liquidity and investment opportunities have a positive relationship with dividend yield. The other determinants have an insignificant relationship with dividend yield (Ringborg & Dai, 2016).

2.5.3 Other Theories Used to Explain Dividend Policy

2.5.3.1 The Catering Theory of Dividends

Baker and Wurgler (2004) introduced the catering theory of dividends. It is based on the idea that investors at times are demanding dividends, and by paying out dividends, managers are catering investors. The decision to pay out dividends is, according to the theory, based on an assumption regarding the premium which investors place on dividend paying stocks. When the premium is large, more firms will start to pay out dividends, and when dividend paying stocks are trading at a discount, firms will omit dividends (Baker & Wurgler, 2004).

Li and Lie (2006) develops the theory, arguing that it is important to take into consideration how much the dividend levels changes, and not only if a firm pays dividends or not. They find that there is a positive relationship between the dividend premium and the change in dividend level, and also the magnitude of the change (Li & Lie, 2006).

2.5.3.2 Dividend Smoothing Model

Linter (1956) established the dividend smoothing model, which implies that firms decide on their dividend payout policy based on long-run earnings targets. This means that even though earnings increases, management will not decide on a corresponding dividend increase until the earnings increase can be deemed stable in the long run. Instead, management tend to set its current year dividend payout to reflect the previous year's payout level. This is because management assumes that investors prefer a stable, smoothed, dividend payout to a more volatile one (Lintner, 1956).

2.5.3.3 Signalling theory

Lintner (1956) stated that when a firm changes its dividends, it will affect the market's view on those dividend paying shares. Miller and Modigliani (1961) notices this statement and comments on their irrelevance theorem that "...investors are likely to (and have good reason to) interpret a change in the dividend rate as a change in management's views of future profit prospects for the firm." (Miller & Modigliani, 1961). Ross (1977) applies Akerlof's (1970) lemons idea to the theory, and Kalay (1980) elaborates it further, stating that a dividend change to convey information (sending a signal) is dependent on managers being reluctant to reduce dividends.

3 Method

In this chapter the research approach is presented as well as the procedure of data collection and the treatment of it. All variables used to construct the regressions are introduced and defined. Thereafter, four regression models that will be used to perform the study are presented and explained. The chapter will end with a review of the study's validity and reliability.

3.1 Research Approach

The purpose of this study is to test the life cycle theory of dividends, and to investigate if the financial crisis had an impact on dividend payout and the life cycle determinants in Sweden. This implies that we want to test an existing theory, and therefore a deductive approach is suitable to empirically test the derived hypotheses (Bryman and Bell, 2013). Furthermore, this study will be performed using logit model regressions executed in Eviews (Brooks, 2014).

The research method used in this study will to a large extent be based on the method developed by DeAngelo et al. (2006), which is an elaboration of the method used by Fama and French (2001). Since DeAngelo et al. (2006) do not investigate the financial crisis' impact on dividend policy, we will also use the method by Kouser et al. (2015), which is based on DeAngelo et al. (2006). However, this method only investigates the probability of a firm to pay dividends, thus ignoring dividend increases and decreases. We could have chosen to develop the method to take this matter into account, but since the purpose of this study can be fulfilled with the existing method, we decide not to.

3.2 Data Collection and Time Period

In order to test the life cycle determinants' effect on dividend payout among Swedish firms, this study includes all firms listed on Nasdaq Stockholm. Even though these firms are not perfectly representative for all Swedish firms, we still believe that the sample will give a good picture of Swedish firms' dividend policy, and how this policy was affected by the financial crisis.

The chosen time period is 2004-2012, in total 9 years. The reason for choosing this period is that we want to be able to investigate the effect of the financial crisis. The pre-crisis period is 2004-2006, the crisis period is 2007-2009, and the after-crisis period is 2010-2012. Using Thomson Reuters DataStream as our source, we collect secondary data. Specifically, for each firm and year, the data consists of dividend yield, total assets, common equity, retained earnings, revenue, net profit and cash equivalents.

3.3 Sample and Exclusions

The original sample consisted of 327 firms, with 113 retrieved from large cap, 114 from mid cap and 100 from small cap. Similar to Kouser et al. (2015), financial firms are excluded from the sample due to their different regulatory policies which they adopted during the financial crisis, e.g. some financial firms did not pay out dividends due to regulations (SOU 2013:6, translated). We use Datastream's sector filtering to identify the firms that are classified either as banks or financial service firms. Furthermore, as we only want to include one kind of share from each firm, we included the share that was traded the most. Lastly, firms with missing data were either complemented manually with data retrieved from annual reports, or excluded from the sample if the necessary data was unavailable. With all exclusions made, the sample consists of 129 firms.

Total number of firms in original sample	327
Financial firms	34
Firms with more than one class of share	16
Firms with missing data	148
Total number of firms after exclusions	**129**

Table 3. Data Collection

3.3.1 Non-Response Analysis

The non-response sample was evenly distributed over the different cap lists. However, since the firms had to be listed during 2004-2012, it is a risk that the large

exclusion due to this requirement has caused non-response bias. The excluded firms are likely to be younger than the included ones, and therefore could affect the results. This could be a problem since we want to test the determinants of the life cycle theory, which implies that it is important to include firms in different stages of the life cycle.

3.4 Variables

The variables used in this study to represent the dependent variable and its determinants, are based on the study by Kouser et al. (2015). They choose and define their variables based on the study by DeAngelo et al. (2006). The regressions will also include control variables and an interaction variable, in similarity to Kouser et al. (2015), and they are explained and defined in section 3.4.3 and 3.4.4, respectively.

3.4.1 Dependent Variable

The dependent variable in this study is the probability to pay out dividends. If a firm pays out dividends, the variable will take the value 1, and otherwise 0. This variable will be dependent on the determinants, and therefore, the probability to pay out dividends will change when the value of the determinants changes. The variable is defined as the natural logarithm of the odds ratio, i.e. the natural logarithm of a firm's probability to pay out dividends divided by a firm's probability to not pay out dividends (Kouser et al, 2015).

$$Probability\ to\ pay\ out\ dividends = \ln(Odds) = ln\left(\frac{P}{1-P}\right)$$

3.4.2 Determinants

3.4.2.1 Profitability

This determinant is represented by the variable return on assets (ROA), which equals earnings divided by total assets (Kouser et al., 2015).

$$ROA = \frac{Earnings}{Total\ Assets}$$

3.4.2.2 Investment Opportunities

This determinant is represented by the variable sales growth rate (SGR), which is equal to the change in revenue between the current and the previous year, divided by previous year's revenue level (Kouser et al, 2015).

$$SGR = \frac{Revenue_t - Revenue_{t-1}}{Revenue_{t-1}}$$

3.4.2.3 Size

This determinant is represented by the variable natural log of total assets (LNTA) (Kouser et al, 2015).

$$LNTA = \ln(Total\ Assets)$$

3.4.2.4 Earned/Contributed Capital Mix

This determinant is represented by retained earnings to total common equity (RE/TE) (Kouser et al, 2015).

$$RE/TE = \frac{Retained\ Earnings}{Total\ Common\ Equity}$$

3.4.2.5 Crisis Determinants

To check the impact of the explicit time period of the financial crisis on dividend payout, time dummies are used. Since the financial crisis took place around year 2008, three dummy variables will be used to account for this effect, D07 representing year 2007, D08 representing year 2008, and D09 representing year 2009. During its corresponding year, each of these dummies will take on the value 1, and otherwise 0 (Kouser et al., 2015).

$$D07; D08; D09 = 1, respectively, during\ its\ corresponding\ year$$

3.4.3 Control Variables

To further test the variables of interest in this study, i.e. the life cycle determinants defined above, the variables described in this subchapter will act as control variables

(Verbeek, 2008). By including control variables, we will be able to determine if a significant relationship for a life cycle determinant really affect firms' dividend payout, or if the effect is attributable to other variables (Sundell, 2012). The variables chosen are included due to their expected relationships with dividend payout, which are based on other dividend theories than the theory we want to test, and earlier tests of the life cycle theory of dividends by DeAngelo et al. (2006) and Kouser et al. (2015).

3.4.3.1 Cash Holdings

This variable is included as a control variable since DeAngelo et al. (2006) consider it to be an ambiguous life cycle determinant, and therefore, cash holdings is not considered an appropriate life cycle determinant. The determinant is equal to cash plus marketable securities divided by total assets (CA/TA).

$$CA/TA = \frac{Cash + Marketable\ Securities}{Total\ Assets}$$

3.4.3.2 Profitability Lagged One Year

This variable is included as a control variable, since it is considered to be a signalling theory determinant (DeAngelo et al., 2006).

$$ROAL1 = \frac{Earnings_{t-1}}{Total\ Assets_{t-1}}$$

3.4.3.3 Total Equity to Total Assets

This variables is included as a control variable, since it could explain if the impact of RE/TE on the probability of paying dividends is attributable to a firm's use of equity, or rather to its mix of internal and external capital (DeAngelo et al., 2006).

$$TE/TA = \frac{Total\ Common\ Equity}{Total\ Assets}$$

3.4.3.4 Lagged Dividend Payout

This dummy variable is included as a control variable, since it is considered to be a dividend smoothing model determinant (DeAngelo et al., 2006). The dummy shows if the firm has paid out dividends in the previous year, and takes on the value of 1 if it has, and 0 otherwise.

$$Divdum = 1 \; if \; the \; firm \; has \; paid \; put \; dividends \; the \; previous \; year$$

3.4.4 Interaction Variable

The interaction variable is included to investigate if the financial crisis had an effect on the life cycle determinants' relationship with dividend payout after the explicit crisis period. This dummy will take on the value of 1 after the crisis, and 0 otherwise.

$$DAFTER = 1 \; after \; the \; financial \; crisis \; period$$

To make sure that the regression including this interaction variable gives us a more reliable output, the interaction variable alone will also be included as an independent dummy variable (Brambor et al., 2006).

3.4.5 Summary of Variables and Predicted Relationships

In table 4, we present a summary of the variables that will be used to perform this study. Furthermore, the predicted relationships between the dependent variable and the independent variables are presented.

Dependent Variable	**Variable**	
Probability to pay out dividends	ln(Odds)	
Determinants	**Variable**	**Predicted relationship to dependent variable**
Profitability	ROA	Positive +
Investment Opportunities	SGR	Negative -
Size	LNTA	Positive +
Earned/Contributed Capital Mix	RE/TE	Positive +
Crisis year 2007	D07	
Crisis year 2008	D08	
Crisis year 2009	D09	
Control Variables		
Cash Holdings	CA/TA	
Profitability lagged one year	ROAL1	
Total Equity to Total Assets	TE/TA	
Lagged dividend payout	Divdum	
Interaction Variable		
DAFTER		

Table 4. Variables included in the regressions

3.5 Logit Models

This study aims to investigate more than one firm during more than one year. This means it will have both time series and cross-sectional elements, and therefore two dimensions, which implies that panel data regressions should be used. However, since the dependent variable in this study takes on only binary numbers, we should use a limited dependent variable model, and more specifically, we should use a logit or probit model (Brooks, 2014). These two models only differ when the split of the dependent variable is very unbalanced between 0 and 1, and therefore the choice will not have a major impact in this study since the data is balanced (see output of regression 1 below heading 4.2.1) (Brooks, 2014). We choose the logit model, which

has also been used by Fama and French (2001), DeAngelo (2006) and Kouser et al. (2015).

The logit function F, as presented below, follows the cumulative logistic distribution (Brooks, 2014):

$$F(zi) = \frac{1}{1 + e^{-zi}}$$

F(zi) depicts the probability that the firm will pay dividends and e represents the exponential. An advantage of the above specified model is the fact that the obtained dividend-payment probability estimates can be neither negative nor larger than one, which is of particular and obvious use in this context (Brooks, 2014).

In this study, odds is the probability (P) to pay out dividends divided by the probability to not pay out dividends (1-P). The probability depends on the independent variables, which contains individual characteristics (Verbeek, 2008). The regression coefficients can be interpreted as describing the effect on the odds ratio (Verbeek, 2008):

$$Ln(Odds) = Ln\left(\frac{P}{1 - P}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k \beta_{ki}$$

The nonlinearity of the logit model implies that it cannot be estimated using OLS, instead maximum likelihood is used (Brooks, 2014). While OLS minimizes the squared error terms, the maximum likelihood method finds the most likely estimates of the regression coefficients in an iterative process. Also, the heteroscedasticity in Var(Y/X) is automatically accounted for when using maximum likelihood estimations. The drawback of this approach is that it is easy to misinterpret the estimated parameters, since the independent variables are not linearly related to the dependent variable. Therefore, a one unit increase in an independent variable will not result in a corresponding change in the value of dependent variable, instead the change will be different from the value of the coefficient of the independent variable (Brooks, 2014). We could compute marginal effects to be able to interpret the estimates in a way similar to the interpretations of OLS regressions (Brooks, 2014).

Marginal effects would in this study show to what extent the variables affect the probability of dividend payout. However, since we do not need to know to what extent the variables affect the probability of dividend payout to fulfil our purpose, it is enough to interpret the coefficients and their significance. Therefore, we can fulfil the purpose of the study without exponentiating the coefficients or computing marginal effects.

3.5.1 Logit Model Regressions

To answer the research questions of this study and to fulfil the purpose, four regressions will be performed. The first regression will include only the life cycle determinants since we first want to investigate the effect of each determinant on dividend payout.

$$Ln(Odds) = \beta_0 + \beta_1(ROA) + \beta_2(SGR) + \beta_3(LNTA) + \beta_4(RE/TE) + \varepsilon$$

The second regression will include all variables from the first regression, and also the control variables.

$$\begin{aligned} Ln(Odds) = \beta_0 + \beta_1(ROA) + \beta_2(SGR) + \beta_3(LNTA) + \beta_4(RE/TE) \\ + \beta_5\,(ROAL1) + \beta_6\,(TE/TA) + \beta_7(CA/TA) + \beta_8(Divdum) + \varepsilon \end{aligned}$$

The third regression will include all variables from the second regression and the crisis determinants. This means that this regression will show what impact the financial crisis had on the probability to pay out dividends.

$$\begin{aligned} Ln(Odds) = \beta_0 + \beta_1(ROA) + \beta_2(SGR) + \beta_3(LNTA) + \beta_4(RE/TE) \\ + \beta_5\,(ROAL1) + \beta_6\,(TE/TA) + \beta_7(CA/TA) + \beta_8(Divdum) \\ + \beta_9(D07) + \beta_{10}(D08) + \beta_{11}(D09) + \varepsilon \end{aligned}$$

In the last regression the interaction variable DAFTER will be added to the second regression to investigate if the financial crisis had an impact on the life cycle determinants' relationship with the probability to pay out dividends.

$$
\begin{aligned}
Ln(Odds) = \beta_0 + \beta_1(ROA) + \beta_2(SGR) + \beta_3(LNTA) + \beta_4(RE/TE) \\
+ \beta_5\,(ROAL1) + \beta_6\,(TE/TA) + \beta_7(CA/TA) + \beta_8(Divdum) \\
+ \beta_9(ROA)(DAFTER) + \beta_{10}(SGR)(DAFTER) \\
+ \beta_{11}(LNTA)(DAFTER) + \beta_{12}(RE/TE)(DAFTER) \\
+ \beta_{13}(ROAL1)(DAFTER) + \beta_{14}(TE/TA)(DAFTER) \\
+ \beta_{15}(CA/TA)(DAFTER) + \beta_{16}(Divdum)(DAFTER) \\
+ \beta_{17}(DAFTER) + \varepsilon
\end{aligned}
$$

3.5.2 Tests of Model

3.5.2.1 Robust covariances

With the logit model, it is possible to ensure that the error estimates are robust to heteroscedasticity (Brooks, 2014). Specifically, we use the Huber/White robust covariances to ensure this.

3.5.2.2 Goodness of Fit and Model Adequacy

Standard goodness of fit measures does not work well with a non-linear model, such as the logit model (Brooks, 2014). The reason is that the fitted values from the model can take on any value between 0 and 1, and the actual values will be either 0 or 1. If the fitted value is 0,8 and the actual value is 1, the model has effectively made the correct prediction, but standard goodness of fit measures will not give it full credit for this (Brooks, 2014). Instead we will use two other measures suggested by Brooks (2014).

First, to check the model adequacy, we will produce a set of in-sample forecasts (Brooks, 2014). In other words, we will construct the fitted values. With the actual and fitted values, we can check to what extent the model correctly or incorrectly predicts observations to pay dividends. The higher the value of correctly predicted observations, the better the fit of the model (Brooks, 2014). It is important to get good predictions both when Y=1 and Y=0, and therefore, we should compute the

percentage that is correctly predicted in each outcome (Wooldridge, 2009). Since it is fairly criticized to use the prediction rule with a threshold value of 0.5, especially if one of the outcomes is very unlikely, the study will instead use the fraction of successes (dividend payouts) as the threshold (Wooldridge, 2009). Eviews offers the function Expectation-Prediction Evaluation to test this.

Second, we will look into the measure pseudo R^2, also known as McFadden's R^2. As the model improves, we will get a higher measure, with the maximum value of one. The negative aspects with this measure, is that it does not have any intuitive interpretation. Thus, it is not correct to make the interpretation that pseudo R^2 measures the proportion of variation in the dependent variable that is explained by the model, as the standard R^2 does (Brooks, 2014).

3.5.2.3 Multicollinearity

It could be problematic to include too many variables in a regression, since it increases the risk for multicollinearity (Wooldridge, 2009). Therefore, we will check for it using a correlation matrix (Brooks, 2014).

3.6 Validity and Reliability

Validity refers to how well the measurements used in a study correspond to what you intend to investigate (Bryman and Bell, 2011). Therefore, the method and variables chosen should also correspond to the purpose of the study. This study uses a methodological framework by Kouser et al. (2015) and DeAngelo et al. (2006), which we deem to be well suited to fulfil the study's purpose.

We have excluded financial firms since they are more likely to be affected by regulations during a financial crisis, and therefore would have distorted the output of the regressions. Furthermore, we adopted the measurement of investment opportunities used by both Kouser et al. (2015) and DeAngelo et al. (2006), i.e. sales growth rate, but did not include the other two measurements used by DeAngelo et al. (2006). If we had chosen to incorporate the second measurement, market to book ratio, there is a possibility that the results could have been different since it measures a firm's investment opportunities in a different way. However, since Kouser et al. (2015) did not include this measurement, and since we want to be able to compare

our results to deepen our analysis, we decided to not include it as well. The third measure that DeAngelo et al. (2006) used, was asset growth rate. We did not include this variable for the same reasons as above, and also since it automatically increases with earnings. Higher earnings increases the probability of paying dividends for reasons unrelated to investment opportunities, which makes asset growth rate a less ideal measure (DeAngelo et al, 2006). Furthermore, Fama and French (2001) argue that the inclusion of lagged dividends is problematic because it explains a firm's current dividend decision on the basis of the prior year's dividend decision, which comes very close to regressing the dependent variable on itself.

If a study is reliable or not refers to whether its results will be the same if the study is repeated (Bryman and Bell, 2011). Since this study uses secondary data, the reliability depends on how correct the information provided by Datastream is. Datastream is a well-known and established source, which is widely used in financial studies. The manually retrieved data from the annual reports was compared to the data available in Datastream to ensure correct matching of data between the sources. Furthermore, since we use an established method, it is likely that this study will be easy to repeat.

4 Results

In this chapter the results of the study are presented. The descriptive statistics are presented first, and thereafter the output of the four regression models. Regressions 2-4 are presented along with tests of the hypotheses. The chapter ends with a presentation of the model diagnostics.

4.1 Descriptive statistics

Below, we present descriptive statistics for the life cycle determinants. For each variable, we calculate the median value for dividend payers and nonpayers in each year, and then calculate the median over 2004–2012.

		Median value	
		Dividend payers	**Nonpayers**
Profitability	**ROA**	0,0761	0,0726
Investment Opportunities	**SGR**	0,0712	0,0755
Size	**LNTA**	15,1860	13,6886
Earned/Contributed Capital Mix	**RE/TE**	0,6522	0,5810

Table 5. Descriptive statistics

Table 5 shows that dividend payers have higher profitability than nonpayers. On the other hand, investment opportunities tend to be lower for the median dividend payer. Size is larger for the median dividend payer than for the nonpayer, and dividend paying firms typically have a greater amount of retained earnings relative to total equity than nonpayers.

4.2 Regression Results

4.2.1 Regression 1

Dependent Variable: LN_ODDS_
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)
Date: 05/09/17 Time: 10:51
Sample: 1 1161
Included observations: 1161
Convergence achieved after 19 iterations
Coefficient covariance computed using the Huber-White method

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.753831	0.843750	-5.634167	0.0000
ROA	4.846939	1.791503	2.705515	0.0068
SGR	-0.467037	0.224484	-2.080490	0.0375
LNTA	0.353067	0.059969	5.887528	0.0000
RE_TE	1.327096	0.347913	3.814443	0.0001

McFadden R-squared	0.369932	Mean dependent var	0.684755
S.D. dependent var	0.464814	S.E. of regression	0.348659
Akaike info criterion	0.793973	Sum squared resid	140.5273
Schwarz criterion	0.815751	Log likelihood	-455.9011
Hannan-Quinn criter.	0.802190	Deviance	911.8023
Restr. deviance	1447.148	Restr. log likelihood	-723.5742
LR statistic	535.3460	Avg. log likelihood	-0.392680
Prob(LR statistic)	0.000000		

Obs with Dep=0	366	Total obs	1161
Obs with Dep=1	795		

In regression 1, we see that all life cycle determinants have a significant relationship with the probability to pay out dividends. Profitability (ROA) has a positive relationship to the dependent variable, indicating that the more profitable a firm is, the more likely it is to pay dividends. Investment opportunities (SGR) has a negative relationship to the dependent variable, meaning that the more investment opportunities a firm has, the less likely it is to pay out dividends. Size (LNTA) has a positive relation with the dependent variable, thus, the larger the firm is, the more likely it is to pay dividends. Earned/contributed capital mix (RE/TE) also has a positive relation with the dependent variable. In other words, the higher retained earnings to total equity a firm has, the more likely it is to pay dividends.

4.2.2 Regression 2

Dependent Variable: LN_ODDS_
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)
Date: 05/09/17 Time: 10:59
Sample: 1 1161
Included observations: 1161
Convergence achieved after 21 iterations
Coefficient covariance computed using the Huber-White method

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.010962	1.101095	-3.642704	0.0003
ROA	3.593317	1.169082	3.073623	0.0021
SGR	-0.173140	0.295295	-0.586330	0.5577
LNTA	0.166695	0.063821	2.611899	0.0090
RE_TE	0.562461	0.176932	3.178965	0.0015
ROAL1	4.267362	1.253434	3.404537	0.0007
TE_TA	0.109975	0.731369	0.150369	0.8805
CA_TA	-0.770834	1.001195	-0.769914	0.4414
DIVDUM	3.644259	0.242746	15.01262	0.0000

McFadden R-squared	0.615162	Mean dependent var	0.684755
S.D. dependent var	0.464814	S.E. of regression	0.267581
Akaike info criterion	0.495192	Sum squared resid	82.48304
Schwarz criterion	0.534394	Log likelihood	-278.4591
Hannan-Quinn criter.	0.509983	Deviance	556.9181
Restr. deviance	1447.148	Restr. log likelihood	-723.5742
LR statistic	890.2302	Avg. log likelihood	-0.239844
Prob(LR statistic)	0.000000		

Obs with Dep=0	366	Total obs	1161
Obs with Dep=1	795		

When controlling for profitability lagged one year (ROAL1), total equity to total assets (TE/TA), cash holdings (CA/TA), and lagged dividend payout (Divdum), all life cycle determinants that were significant in regression 1, are still significant with the same relationships, except for SGR, which is now insignificant. Since only three out of four life cycle determinants are significant, we cannot reject the first null hypothesis.

Hypothesis 1

H_0: The life cycle theory determinants do not determine dividend policy in Sweden

H_1: The life cycle theory determinants determine dividend policy in Sweden

4.2.3 Regression 3

Dependent Variable: LN_ODDS_
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)
Date: 05/09/17 Time: 11:01
Sample: 1 1161
Included observations: 1161
Convergence achieved after 23 iterations
Coefficient covariance computed using the Huber-White method

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.084232	1.130159	-3.613857	0.0003
ROA	3.011516	1.131898	2.660590	0.0078
SGR	-0.396709	0.258869	-1.532471	0.1254
LNTA	0.173729	0.064454	2.695414	0.0070
RE_TE	0.587725	0.182905	3.213285	0.0013
ROAL1	4.977627	1.346594	3.696458	0.0002
TE_TA	0.378944	0.782822	0.484074	0.6283
CA_TA	-0.874804	1.068186	-0.818962	0.4128
DIVDUM	3.893320	0.267565	14.55093	0.0000
D_07_	0.116651	0.363688	0.320745	0.7484
D_08_	-0.602423	0.418207	-1.440489	0.1497
D_09_	-1.514708	0.399673	-3.789866	0.0002

McFadden R-squared	0.628859	Mean dependent var	0.684755
S.D. dependent var	0.464814	S.E. of regression	0.265984
Akaike info criterion	0.483287	Sum squared resid	81.28881
Schwarz criterion	0.535556	Log likelihood	-268.5479
Hannan-Quinn criter.	0.503008	Deviance	537.0959
Restr. deviance	1447.148	Restr. log likelihood	-723.5742
LR statistic	910.0524	Avg. log likelihood	-0.231307
Prob(LR statistic)	0.000000		

Obs with Dep=0	366	Total obs	1161
Obs with Dep=1	795		

The time dummies for 2007 and 2008 do not have significant relationships with the dependent variable, and therefore the probability of dividend payout among Swedish firms did not change significantly during these years. However, the time dummy of 2009 does have a negative significant relationship with the probability of dividend payout. Thus, during 2009, it is possible that the financial crisis had a negative effect on the probability of dividend payouts among Swedish firms. This means that we reject the second null hypothesis.

Hypothesis 2

H_0: The financial crisis did not affect dividend payout of Swedish firms

H_1: The financial crisis affected dividend payout of Swedish firms

4.2.4 Regression 4

Dependent Variable: LN_ODDS_
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)
Date: 05/09/17 Time: 13:54
Sample: 1 1161
Included observations: 1161
Convergence achieved after 16 iterations
Coefficient covariance computed using the Huber-White method

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.071684	1.235485	-3.295616	0.0010
ROA	5.024469	1.569498	3.201323	0.0014
SGR	-0.190830	0.310101	-0.615382	0.5383
LNTA	0.163789	0.074228	2.206585	0.0273
RE_TE	0.607893	0.192463	3.158492	0.0016
ROAL1	4.657675	1.401920	3.322355	0.0009
TE_TA	-0.199248	0.775950	-0.256779	0.7973
CA_TA	-0.635640	1.051736	-0.604372	0.5456
DIVDUM	3.631332	0.242005	15.00517	0.0000
ROAAFTER	-0.174364	0.153888	-1.133057	0.2572
SGRAFTER	-1.120794	1.235632	-0.907061	0.3644
LNTAAFTER	-0.022633	0.127930	-0.176921	0.8596
RE_TEAFTER	-0.227788	1.694590	-0.134421	0.8931
ROALAFTER	-1.015956	1.481352	-0.685830	0.4928
TE_TAAFTER	1.253019	2.591756	0.483463	0.6288
CA_TAAFTER	1.641218	1.814815	0.904345	0.3658
DIVDUMAFTER	4.714666	28.93111	0.162962	0.8705
DAFTER	0.874134	1.961240	0.445705	0.6558

McFadden R-squared	0.618116	Mean dependent var	0.684755
S.D. dependent var	0.464814	S.E. of regression	0.267090
Akaike info criterion	0.507014	Sum squared resid	81.53826
Schwarz criterion	0.585418	Log likelihood	-276.3215
Hannan-Quinn criter.	0.536596	Deviance	552.6431
Restr. deviance	1447.148	Restr. log likelihood	-723.5742
LR statistic	894.5052	Avg. log likelihood	-0.238003
Prob(LR statistic)	0.000000		

Obs with Dep=0	366	Total obs	1161
Obs with Dep=1	795		

There are no significant relationships when combining the interaction variable with the variables from regression 2. Therefore, the life cycle determinants' relationship to the probability to pay out dividends did not change significantly because of the crisis. This means that we can not reject the third null hypothesis.

Hypothesis 3

H_0: The life cycle theory determinants' relationship to dividend payout did not change due to the financial crisis.

H_1: The life cycle determinants' relationship to dividend payout changed due to the financial crisis.

4.2.5 Summary of Findings

- After inclusion of control variables, profitability, size, and earned/contributed capital mix are significant and shows the predicted relationships, while investment opportunities is not significant.
- The financial crisis had a significant negative impact on the probability to pay out dividends among Swedish firms in 2009.
- The financial crisis did not affect the life cycle determinants' effect on the probability to pay out dividends.

4.3 Model Diagnostics

To test the appropriateness of the model, several tests have been done. Only the tests conducted on regression 2 will be presented here, since it includes all variables except the time dummies and interaction variable. The Expectation-Prediction Evaluations conducted on the other three regressions can be seen in appendices 1, 3 and 4. The McFadden Pseudo R^2s can be seen in each regression output.

4.3.1 Model Adequacy

According to Eviews' function Expectation-Prediction Evaluation, the model predicted 89.62 percent of the nonpayers sample correctly, and 91.57 percent of the dividend paying sample (see appendix 2). Therefore, the set of predictions is to be considered reasonable (Brooks, 2014). The McFadden Pseudo R^2 in Regression 2 is 0.615162 and should be considered high, since this measure tends to be quite low in limited dependent variable models (Brooks, 2014).

4.3.2 Multicollinearity

Looking in appendix 5, multicollinearity does not exist among the variables (the independent variables and the control variables). Not surprisingly, lagged profitability and current profitability are the most correlated. However the correlation does not exceed the proposed limit of 0,8 by Brooks (2014).

5 Analysis & Discussion

In this chapter the results are analysed and discussed using the life cycle theory of dividends and previous research. This will be done for all of the study's research questions.

5.1 Introduction

Since the sample consists of 795 dividend paying firms out of 1161 firms (see output of regression 1 below heading 4.2.1), it is evident that dividend payout is a common practice for Swedish firms, and therefore an important matter since dividend policy has a strong connection to investment and financing decisions (Baker, 2009). Furthermore, the output from the descriptive statistics (see table 5) is in line with the life cycle theory of dividends, giving this analysis an interesting starting point.

5.2 Analysis of Regression 1 and 2

In regression 1, the output shows significant relationships with the probability of dividend payout for all life cycle determinants. More specifically, firms with higher profitability, smaller investment opportunities, larger size, and higher earned/contributed capital mix have a higher probability of paying out dividends. All of these findings are in line with what the life cycle theory of dividends predicts (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006).

However, when controlling for other variables in regression 2, the relationship for investment opportunities becomes insignificant. This implies that the relationship between investment opportunities and the probability to pay out dividends may be caused by one of the added control variables, thus investment opportunities cast doubts on the explanation power of the life cycle theory of dividends. According to Mueller (1972), young firms should reinvest their earnings to be able to realize investment opportunities, and when the market becomes saturated in the long rung, the mature firms should start to pay out their earnings to shareholders due to the lack of profitable investment opportunities. Since the results of this study show an insignificant relationship for investment opportunities, the reasoning of Mueller (1972) appear to not be applicable on Swedish firms' dividend policy. Furthermore,

based on Mueller's (1972) argument regarding agency problems, there is a possibility that this finding also could imply that managements of Swedish firms not always act in the best interest of the shareholders, e.g. that a mature firm do not pay out dividends. If the management acted in the best interest of the shareholders, this determinant should have been significantly negative, in accordance with Mueller's (1972) reasoning.

Ringborg and Dai (2016) found a positive relationship for investment opportunities in Sweden, which contradicts what the life cycle theory of dividends predicts. Their result is in line with the findings of Thantawee (2011) in Thailand. Furthermore, Denis & Osobov (2008) found mixed relationships for investment opportunities and the probability to pay out dividends in an international context. Hence, our study's inconclusive findings regarding the relationship of investment opportunities with the probability of dividend payout are not totally unexpected.

The findings from regression 2 suggest that Swedish firms' probability to pay out dividends increases when profitability increases. This is in line with the life cycle theory of dividends (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006). Mueller (1972) argues that the more profitable a firm is, the more mature it should be, and the more dividends it should pay out. Therefore, the results of this study imply that more profitable Swedish firms are more mature, hence more likely to pay out dividends than less profitable ones. However, Johansson and Ladan (2014) found the opposite relationship for profitability in Sweden. This could be explained by that most of their research was conducted during the financial crisis, and they argue that firms act differently during such a period (Johansson and Ladan, 2014).

The findings from regression 2 suggest that Swedish firms probability to pay out dividends increases with firm size. This is in line with the life cycle theory of dividends (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006). Mueller (1972) argue that the larger a firm is, the more mature it should be, thus paying out more dividends. Therefore, the results of this study implies that larger Swedish firms are more mature, hence more likely to pay out dividends than smaller ones.

The findings from regression 2 suggest that Swedish firms probability to pay out dividends increases with the earned/contributed capital mix, i.e. a higher proportion of retained earnings to total equity. This is in line with the life cycle theory of dividends (DeAngelo et al., 2006). DeAngelo et al. (2006) argue that the higher retained earnings to total equity a firm has, the more mature it should be, thus paying out more dividends. Therefore, the results of this study implies that Swedish firms with a large proportion of retained earnings to total equity are more mature, hence more likely to pay out dividends than firms with less retained earnings to total equity.

5.3 Analysis of Regression 3 and 4

The probability of dividend payout was negatively affected in Sweden during 2009, and could therefore be linked to the effect of the financial crisis. Kouser et al. (2015) found that the probability of dividend payout decreased significantly during all crisis years, implying that Pakistani firms' dividend payout was affected earlier by the crisis than Swedish ones. The decline in the probability to pay dividends during 2009 in Sweden could be explained by the increased costs and difficulties in receiving external financing (Riksbanken, 2012), implying that firms should have been more reluctant to pay out dividends to be able to finance investments with internal (cheaper) capital, i.e. use a substitute form of financing (Bliss et al., 2015). With respect to other possible effects taking place in Sweden during 2009, there is a possibility that the decrease in the probability of dividend payout was not entirely caused by the financial crisis.

Since the financial crisis had an impact on the probability to pay out dividends during the crisis, it is a possibility that the crisis affected Swedish firms' reasoning regarding dividend policy. Thus, the relationship between dividend payout and the determinants of the life cycle theory might have been affected by the crisis. However, it is evident from the results that the financial crisis did not significantly affect the life cycle determinants' relationship with the probability to pay out dividends. This means that the crisis itself did not significantly affect the importance of the life cycle determinants' effect on dividend payout. Kouser et al. (2015) found that the financial crisis had an impact on some of the life cycle determinants' effect on dividend payout in Pakistan, thus contradicting the results of this study. Specifically, among the significant life cycle determinants from regression 2, Kouser

et al. (2015) found that the effect of size and profitability on the probability to pay dividends did change significantly after the financial crisis. This implies that the dividend policy of Pakistani firms was more affected by the financial crisis than that of Swedish firms.

6 Conclusion

In this chapter a conclusion is drawn from the results and analysis. Further, we attempt to clarify how the results are contributing to the existing knowledge regarding dividend policy, and how the findings can be generalised and used in the future. The chapter ends with a few suggestions regarding further research on the topic.

This study sets out to test the life cycle theory of dividends, and to investigate if the financial crisis had an impact on dividend payout and the life cycle determinants in Sweden. With reference to this, we wanted to fill the research gap identified in the problem discussion. The results of this study have shown that three out of four determinants of the life cycle theory of dividends have significant and predicted relationships with dividend payout, hence we find partial support for the theory in a Swedish context (Mueller, 1972; Fama & French, 2001; DeAngelo et al., 2006). Further, the results have shown that it is likely that the financial crisis negatively affected dividend payout of Swedish firms, and also that the determinants of the life cycle theory did not change due to the financial crisis. Hence, we deem the purpose of this study to be fulfilled.

However, the significance of the findings is somewhat unclear since the study does not find full support for the life cycle theory of dividends in Sweden, as investment opportunities is insignificant in regression 2. DeAngelo et al. (2006) used other measures in addition to sales growth rate to account for investment opportunities when testing the life cycle theory of dividends. Therefore, it is a possibility that the results of this study would have been different if those measures were used.

The findings of this study contributes to the understanding of dividend policy as it finds partial support for an, to our knowledge, untested theory in Sweden. Therefore, this study provides investors and academics with new information regarding the impact of the life cycle stage of a firm on dividend payout. Further, the results strengthen the international findings on the life cycle theory of dividends. With regard to this, we think that we have added a small piece in the scope of solving the dividend puzzle.

Further, our results indicate that relationship between dividend payout and the life cycle determinants did not change due to the financial crisis. This finding could be of interest for investors with specific dividend preferences, as it is useful to know whether or not firms' dividend policy changes due to a crisis. It could also be of use for the world of academics, as it is always of interest to understand more about the effects of financial crises.

The study concludes that dividend payout in Sweden was negatively affected by the financial crisis in 2009, hence it is likely that managements of Swedish firms used a more restrained dividend strategy during the crisis. The finding provides information on how Swedish firms might act during a crisis, which could help legislators make more informed decisions when trying to stabilize the health of the economy during and after a financial crisis. Since financial crises are recurring events (Colander et al., 2009), it is likely that these kinds of decisions will have to be made in the future.

6.1 Further Research

Dividend policy is an extensive research field that engages many academics. Therefore, there are many ways to continue and develop our research. Here we list some suggestions that we find particularly interesting:

- Our study only investigates the probability of dividend payout. We believe it would be interesting to study the changes in dividend payout, i.e. increases and decreases, to deepen the understanding regarding the effect of the life cycle determinants on dividend policy.
- To further test the reliability of the determinants of the life cycle theory of dividends, it would be interesting to include even more control variables in the study. In particular, the inclusion of macro variables could provide more insight of the theory.
- The time period of this study is quite long since we wanted to investigate the effect of the financial crisis, and therefore the exclusions made are large. It is possible that using a shorter time period with the same criteria would lead to a larger sample, which could further assess the theory.

- To further test the life cycle theory of dividends, we suggest that the study is performed on other countries and regions.

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Appendices

Appendix 1 Expectation-Prediction Evaluation for Regression 1

Expectation-Prediction Evaluation for Binary Specification
Equation: UNTITLED
Date: 05/09/17 Time: 10:53
Success cutoff: C = 0.684755

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	270	117	387	366	795	1161
P(Dep=1)>C	96	678	774	0	0	0
Total	366	795	1161	366	795	1161
Correct	270	678	948	366	0	366
% Correct	73.77	85.28	81.65	100.00	0.00	31.52
% Incorrect	26.23	14.72	18.35	0.00	100.00	68.48
Total Gain*	-26.23	85.28	50.13			
Percent Gain**	NA	85.28	73.21			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	223.77	142.23	366.00	115.38	250.62	366.00
E(# of Dep=1)	142.23	652.77	795.00	250.62	544.38	795.00
Total	366.00	795.00	1161.00	366.00	795.00	1161.00
Correct	223.77	652.77	876.55	115.38	544.38	659.76
% Correct	61.14	82.11	75.50	31.52	68.48	56.83
% Incorrect	38.86	17.89	24.50	68.48	31.52	43.17
Total Gain*	29.62	13.63	18.67			
Percent Gain**	43.25	43.25	43.25			

*Change in "% Correct" from default (constant probability) specification
**Percent of incorrect (default) prediction corrected by equation

Appendix 2 Expectation-Prediction Evaluation for Regression 2

Expectation-Prediction Evaluation for Binary Specification
Equation: UNTITLED
Date: 05/09/17 Time: 10:59
Success cutoff: C = 0.684755

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	328	67	395	366	795	1161
P(Dep=1)>C	38	728	766	0	0	0
Total	366	795	1161	366	795	1161
Correct	328	728	1056	366	0	366
% Correct	89.62	91.57	90.96	100.00	0.00	31.52
% Incorrect	10.38	8.43	9.04	0.00	100.00	68.48
Total Gain*	-10.38	91.57	59.43			
Percent Gain**	NA	91.57	86.79			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	285.20	80.80	366.00	115.38	250.62	366.00
E(# of Dep=1)	80.80	714.20	795.00	250.62	544.38	795.00
Total	366.00	795.00	1161.00	366.00	795.00	1161.00
Correct	285.20	714.20	999.41	115.38	544.38	659.76
% Correct	77.92	89.84	86.08	31.52	68.48	56.83
% Incorrect	22.08	10.16	13.92	68.48	31.52	43.17
Total Gain*	46.40	21.36	29.25			
Percent Gain**	67.76	67.76	67.76			

*Change in "% Correct" from default (constant probability) specification
**Percent of incorrect (default) prediction corrected by equation

Appendix 3 Expectation-Prediction Evaluation for Regression 3

Expectation-Prediction Evaluation for Binary Specification
Equation: UNTITLED
Date: 05/09/17 Time: 11:01
Success cutoff: C = 0.684755

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	330	68	398	366	795	1161
P(Dep=1)>C	36	727	763	0	0	0
Total	366	795	1161	366	795	1161
Correct	330	727	1057	366	0	366
% Correct	90.16	91.45	91.04	100.00	0.00	31.52
% Incorrect	9.84	8.55	8.96	0.00	100.00	68.48
Total Gain*	-9.84	91.45	59.52			
Percent Gain**	NA	91.45	86.92			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	286.80	79.20	366.00	115.38	250.62	366.00
E(# of Dep=1)	79.20	715.80	795.00	250.62	544.38	795.00
Total	366.00	795.00	1161.00	366.00	795.00	1161.00
Correct	286.80	715.80	1002.60	115.38	544.38	659.76
% Correct	78.36	90.04	86.36	31.52	68.48	56.83
% Incorrect	21.64	9.96	13.64	68.48	31.52	43.17
Total Gain*	46.84	21.56	29.53			
Percent Gain**	68.40	68.40	68.40			

*Change in "% Correct" from default (constant probability) specification
**Percent of incorrect (default) prediction corrected by equation

Appendix 4 Expectation-Prediction Evaluation for Regression 4

Expectation-Prediction Evaluation for Binary Specification
Equation: UNTITLED
Date: 05/09/17 Time: 11:04
Success cutoff: C = 0.684755

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	330	67	397	366	795	1161
P(Dep=1)>C	36	728	764	0	0	0
Total	366	795	1161	366	795	1161
Correct	330	728	1058	366	0	366
% Correct	90.16	91.57	91.13	100.00	0.00	31.52
% Incorrect	9.84	8.43	8.87	0.00	100.00	68.48
Total Gain*	-9.84	91.57	59.60			
Percent Gain**	NA	91.57	87.04			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	285.80	80.20	366.00	115.38	250.62	366.00
E(# of Dep=1)	80.20	714.80	795.00	250.62	544.38	795.00
Total	366.00	795.00	1161.00	366.00	795.00	1161.00
Correct	285.80	714.80	1000.61	115.38	544.38	659.76
% Correct	78.09	89.91	86.19	31.52	68.48	56.83
% Incorrect	21.91	10.09	13.81	68.48	31.52	43.17
Total Gain*	46.56	21.44	29.36			
Percent Gain**	68.00	68.00	68.00			

*Change in "% Correct" from default (constant probability) specification
**Percent of incorrect (default) prediction corrected by equation

Appendix 5 Correlation Matrix

	ROA	SGR	LNTA	RE_TE	ROAL1	TE_TA	CA_TA	DIVDUM
ROA	1	-0,196	0,318	0,246	0,601	-0,017	-0,319	0,359
SGR	-0,196	1	-0,046	0,003	-0,203	0,015	0,095	-0,041
LNTA	0,318	-0,046	1	0,120	0,349	-0,440	-0,400	0,473
RE_TE	0,246	0,003	0,120	1	0,123	0,065	-0,029	0,112
ROAL1	0,601	-0,203	0,349	0,123	1	-0,100	-0,355	0,418
TE_TA	-0,017	0,015	-0,440	0,065	-0,100	1	0,566	-0,317
CA_TA	-0,319	0,095	-0,400	-0,029	-0,355	0,566	1	-0,376
DIVDUM	0,359	-0,041	0,473	0,112	0,418	-0,317	-0,376	1