Asymmetric information in equilibrium prices for controlling accounting services.

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Content

Introduction

The current accounting system is facing a high pressure. Mainly the accountants that fulfill controlling services do feel this pressure. Many scandals over the last couple of years are responsible for this pressure. An example is the Ballast Nedam case, in which the client bribed the accountant. The accountant gave a false statement about the company's assets (Dohmen, 2014). Another more current example is the Vestia case. Vestia is a housing cooperation based in Rotterdam. Vestia took very big risks with derivatives, which were clearly irresponsible. The ING bank even wrote a letter to the board of directors of Vestia to express its concerns. Vestia eventually needed to be saved from bankruptcy by other housing cooperation's. The accountant eventually admitted that there were mistakes in the statement and took back the accounting signature. Now it is clear that the accountant broke some rules during the control of Vestia's financial safety (Driessen, 2013). Because of this incident a high amount of community money was wasted, which reveals how important correct control by an accountant is for the whole society.

The current accounting system is based on trust, the trust in an accountant to fulfill his job correct. There are many services an accountant can do within a company, but for this paper we focus on the controlling service. A controlling accountant is responsible for giving objective and integer information about the assets, liabilities and equity of the company. This information is mainly important for the supervisory board of a company, the stakeholders and other investors. Other investors are for example banks that give a loan to the company. The controlling accountant gives a signature under his stated information, which should represent the fulfillment of his service in an objective and integer way. This signature represents the trust where the accounting system is built upon. A false or wrong statement can lead to the fact that a Bank or a person will invest in a company thinking it is a good decision, while the opposite is true. In this way a company can still get a loan or can satisfy the stakeholders, based on wrong figures. Also the terms of a loan are better when the risk of a loan appears is lower, as the interest rate includes the risk for a loan (Wong, 1997). When the controlling accountant fulfills his service incorrectly this may have a positive effect on the company. This is where the complexity in the market for the accounting service becomes clear. Normally a company that demands for a good or a service wants to have a good with the right quality or wants the service to be done correctly. However in the market for accounting services clients can be better off when the service is done incorrectly. But accountants are obligated by law to fulfill their services correctly and independently. This results in the fact that a principal-agent problem exists since the principal and the agent do not have the same wishes about the service an accountant fulfills. The fact that the controlling accountant is paid by the company could lead to a high pressure to give wrong or false information in the statement. The demanding company has got power to put pressure on the accountant because eventually accountants want to be paid (Zonneveld, 2012). This pressure made that many controlling accountants completed their services incorrectly which damaged the trust of society in an accounting signature. This damaged trust causes difficulty for financial markets to work efficiently (Boot & Soeting, 2003). For example the decision whether or not it is a good choice to give a loan to a company will no longer be made upon the information above the accountant signature, because of the lack of trust. The pressure on the current accounting system resulted in the fact that the four big accountancy companies in the Netherlands, KMPG, PWC, EY and Deliotte, already took actions to increase the control on a controlling accountant (NOS, 2012). But Marcel Pheijffer, professor at the Nyenrode Business Universiteit reckons that there is still an enormous pressure on the current accounting system. Therefore further actions are necessary (Vaassen, 2013).

The European Parliament is working to create rules and guidance to make sure that the accountants will again fulfill their services with more integrity and earn back the trust of the society. Therefore the principal-agent problem that mainly causes the pressure on the accountants needs to be solved. The Dutch government was not in favour of waiting for the European parliament to implement their policy. They already created certain laws for the Netherlands. One of these laws obligates the circulation of accounting companies every 8 years (Piersma, 2013). Only the controlling part of the accounting services is obligated to circulate. The law will be implemented in 2016 and will only apply for so called OOB's which translated in Dutch that means *organisaties van openbaar belang*. These are organisations that have a significantly high impact on society. That can be the case because of the function of the company or the size of it (BDO, 2013). Examples of an OOB are: banks, insurance companies and all the companies that are listed on the stock market. Through fulfilling an important function in society a lot of government institutions are seen as an OOB as well. For example the housing cooperation Vestia, which makes it possible for people to rent a house. With the law about the circulation of the controlling accountant the Dutch government wants to make sure that the relationship between the controlling accountant and the client will not grow too tight. A tight relationship can result in a lack of objectivity when signing the accounting statement (Guediche, 2012). Also the fact that the accountant knows that he can only loose a few years of work at the same client instead of a long lasting contract will decrease the pressure a client can put on the controlling accountant. This results in less pressure on his objectivity and less pressure on his integrity (Guediche, 2012).

Beside the effects discussed before the circulation will also result in a more frequent demand for the controlling accounting services. But how does this market works?
The Dutch market for accounting control comes down to 900 million euro's a year, this is only the accounting control obligated by law (ING Economisch Bureau, 2010). The accountants often work with fixed contract. The price of this contract is based upon the amount of time the accountant thinks he needs to spend before completing his service (Davidts, 2010). In the market for accounting services exists a Bertrand equilibrium. In a Bertrand equilibrium two players compete with each other by setting an competitive price (Vives, 1984). The marginal costs are equal to this competitive price. Therefore none of the companies make any profit. It will not pay off to raise the price because all clients will purchase the goods or services at the other company with the lower price. This is possible because in this market an accounting company is not competing on quantity.
When looking at the market for accounting services the supply exists basically out of the services of the employees, which is labour. Labour is a quasi-fixed production factor (Oi, 1962). In the market for accounting services the skilled employees are transferable within this market. When an accounting company raises its price it will lose clients. These clients will go to another accounting company. The other accounting company can supply this service. It can supply this service by hiring skilled employees that lost their jobs at the first accounting company, which raised its price. This is known in the market for accounting services and therefore both accountancy companies will not raise their prices. Competition in the market for accounting services is therefore based on price which makes it a Bertrand equilibrium.

Furthermore there is asymmetric information. Below is a simplified reconstruction of the asymmetric information in the market for the controlling accounting services. This simplification is needed to create a workable model further on in this paper.
The client of an accounting company knows the amount of time an accountant needs to spend on fulfilling his service at that client, because the client knows the exact time the previous accountant spend for the controlling services. When all accountancy companies are expected to work with the same efficiency, the knowledge of the client will give a good indication. The accounting company does not know the time it needs to spend to fulfill the controlling services at that client. Therefore the client has got more information compared to the accounting company, which leads to an asymmetric information game. In this game the client can give the right information to an accounting company or they can give a wrong message. With this wrong message the client wants to mislead the accounting company and get a low price for the service contract.

This paper is based on two characteristic out of the market for accounting services. These characteristics are the asymmetric information and the fact that the strong relationship between the accountant and his client will disappear because of the new regulation. The circulation law will result in a low value of the reputation of all players in this market, because the frequency of the use of their reputation will decrease (Milgrom, 1982). Building a strong reputation is the reason why a company in an asymmetric information market would be honest. The low value of the reputation will no longer give clients a reason not to abuse the asymmetric information benefits they have.
The research question therefore is:

<u>How does asymmetric information in the market for controlling accounting services affect equilibrium prices?</u>

This question will be answered with the help of a mathematic model. This model provides an overview of the equilibrium price under different chances of honesty of the clients. This model found that the equilibrium price adapts to the chance for which a company will send the right message about the time that needs to be spent before the service will be fulfilled. A client can choose to be honest about the actual time needed for the controlling service. It can also choose to send a strategic message towards the accounting company to lower the expected time needed to fulfill the controlling service. That will also drop the price set by an accountancy company because the price equals the costs and the costs exists out of the time needed to fulfill the controlling service. The price set by the accountancy company equals the costs an accountancy company faces because of the Bertrand competition in this market.

There is a pure strategy when the chance that a client will send a strategic message lies between 0 and 33.3%. In that case a strategic message will be the lowest message possible in the model. When the chance that a client will send a strategic message is above 33.3% a mixed strategy equilibrium will occur in the model. This leads to a certain ratio that the strategic message will be the lowest possible message. With the residual of the ratio the strategic message will be the second-last message possible. Only with that specific ratio a stable equilibrium can appear. When there is zero chance a company will send an honest message a pure strategy appears again. In that case every client will send the lowest message possible. In the next section the model will be fully explained.

The model

The model in this paper examines how an equilibrium price appears in the market for controlling accounting services. To be more specific in this market a price will be set by an accounting company for its services at the company that demands for the services. The company that demands for the services will be called the client from now on.

There are three players in this model. The first player is the client and the other two players are accountancy companies. All three players are expected to be rational. In this model the name or the reputation of the accountancy company does not play any role for the client when choosing between them, the client will make a choice only based on the price charged by the accountancy company. The model contains a Bertrand equilibrium which leads to no possible mark-up for the accounting companies. Therefore the price charged by the accounting company is equal to the costs they will make for fulfilling the service. In this model the only factor that is responsible for the costs of fulfilling the controlling service is the time needed by the accountancy company. The accountancy company does not know the actual time it needs to fulfill this controlling service, therefore it uses all the information available to calculate an expected time it needs to spend on the service. The expected time needed to complete the controlling service therefore equals the price an accountancy company will charge.

In this model the clients are divided in 4 different time types, every type has got its own value of time that an accounting company needs to spend before completing its service. The value of time is called V, and the four different types are 0, 1/3, 2/3 and 1. The V= 0 is the lowest value and V= 1 is the highest. The chance a company is either V= 0, 1/3, 2/3 or 1 is all equal to ¼. This is the only initial information an accountancy company has got about the client.

Here below the distribution of V is drawn to make it clearer.

Distribution of value V:

$0t$	$\frac{1}{3}$	$\frac{2}{3}$	1

The utility of the accounting company is given by the function: P-V.

The utility of the client is given by the function: V-P.

- V: is the time an accountancy company needs to spend to fulfill the controlling service at a client.
- P: is the price based upon the expected time spent by an accountancy company to fulfill the controlling service at a client.

The utility function of the client does not hold when the client is sending a honest message. This function only holds for the strategic clients. The fact that they send a strategic message shows that they care about paying the lowest price possible for the controlling accounting service. The utilities are exactly the opposite of each other because an accounting company would like to charge a high price, and make profit.

Besides the initial information about the distribution an accountancy company also receives a message from the client. This message is called M, and the four different messages that can be send to an accountancy company are M=0, M=1/3, M=2/3 or M=1. The client knows the actual time V an accountant needs to fulfill its service at that company but the accountant does not know this time V. This leads to a market with asymmetric information. In this model the accounting company is forbidden by law to fulfill its services at the same company for longer than eight years. Therefore the possibility to build a long-term relationship between an accounting company and the client does not exist, which is the intention of the law. This lack of a long-term relationship between the 2 parties results in the fact that reputation is not of any value in this model. An incentive to building a strong reputation leads to an incentive to send an honest message. Because there is no incentive to build a strong reputation there is also no incentive to send an honest message. The research question is based upon the fact that a strong relationship between the controlling accountant and his client is less valuable and the fact that there is asymmetric information in this model. These market imperfections create a game theoretical problem. It might pay off for the client to send a strategic message instead of an honest message. This way the client tries to signal the lowest possible expected value V. When a message is strategic this message will always be lower or the same compared to the actual value V. A higher message would be irrational because the aim of a strategic message is to lower the expected value V compared to the actual value V. The expected value V is the determining factor when the accountancy company is setting its price, so the eventually charged price will also be lower when the expected value V is lower. In this model the chance that the client will send an honest message is represented by π, and the chance that a client will send a strategic message is represented by $(1-\pi)$.

All the chronological steps within this model will be explained below.

- First step: the client offers a controlling service contract on the market for accounting services. Also the client will send a message M with the time needed to fulfill this controlling service, this M can be a strategic or an honest message.
- Second step: the two accountancy companies will charge a price P based upon their expected value V needed to fulfill the controlling service at that client.
- Third step: the client will choose for the accounting company that charges the least, which makes a mark-up on the price charged by the accountancy company impossible. The price accepted by the client is the equilibrium price and which equals the costs.

The equilibrium in a pure strategy.

To get to know more about the equilibrium price it is needed to know more about the expected value V. The price charged by the accountancy company is based upon this expected value V. The first instinct of a client which will give a strategic message is that it will give the lowest message possible. By sending the lowest message the client hopes to create the lowest expected value V. But is this a stable strategy?

The variables used to examine the stability of the pure strategy M=0 are described before, but for clarity repeated below.
- V: is the time an accountancy company needs to spend to fulfill the controlling service at a client.
- M: is the message a client sends to the accounting company to signal the time needed for the control service.
- π: the chance that a client will send a honest message to the accounting company.
- (1-π): the chance that a client will send a strategic message to the accounting company.

The lowest possible message in the model is M=0t. To test whether M=0 is a pure strategy we will use Bayer's Rule. First it needs to be clear what a pure strategy is. A pure strategy means that in the equilibrium there is a 100 percent chance that a specific strategy is chosen (Harsanyi, 1973). In this model a pure strategy appears when an equilibrium holds when the only strategic message is to send the message M=0. If there is an incentive to choose another strategic message the equilibrium is no pure strategy. Second the term Bayers' Rule needs be clear. Bayes' rule is a mathematic method to find out the chance that a certain event will happen given the fact that another event happens (Holt & Anderson, 1996).
Mathematically this is written as:

$$P(A \mid C) = \frac{P(C|A) * P(A)}{P(C|A) * P(A) + P(C|B) * P(B)}$$

In words this is the chance that event A will happen given the fact that event C happens.

The outcomes of Bayers' Rule also introduce a new variable, described below.
- β: the chance that V=0 when M=0 is given.
- (1-β): the chance that V≠0 when M=0 is given.

Now these terms are clear the stability of a pure strategy can be examined. First the chance that V=0 given M=0 needs to be calculated, which is represented by β. This can be calculated as follows: divide the actual chance when M is 0 and the V is also 0 with the total chance that message M=0 is send by a client. The actual chance that V=0 is ¼ out of the chance that a message is honest plus ¼ out of the chance that a message is strategic. This is mathematically written as:

$$\frac{1}{4} * \pi + \frac{1}{4} * (1 - \pi)$$

This needs to be divided by the chance that the message M=0 is actually send. This message is send by ¼ out of the chance that a message is honest, because of the initial distribution. This needs to be added up by the total chance that a message is strategic, because all strategic messages send M=0. This lead to:

$$\frac{1}{4} * \pi + 1 * (1 - \pi)$$

The β will therefore be:

$$P(V = 0|M = 0) = \beta = \frac{\frac{1}{4} * \pi + \frac{1}{4} * (1 - \pi)}{\frac{1}{4} * \pi + 1 * (1 - \pi)}$$

$$\boldsymbol{\beta} = \frac{\mathbf{\frac{1}{4}}}{\mathbf{1} - \mathbf{\frac{3}{4}} * \boldsymbol{\pi}}$$

With this information it is possible to find the expected value V when all strategic messages are M=0. This needs to be done by looking what the expected value V will be when V ≠0 while M=0 is send. This is done by summing up all three possible other V's, except 0, and divide them by 3. This leads to 1/3 plus 2/3 plus 1 = 2, and that divided by 3 gives 2/3, which is the expected value V when V≠0 when M=0 is given.

The total expected value of V when a message 0t is given therefore results in:

$$Expected\ value\ V = \beta * 0 + (1 - \beta) * \frac{2}{3}$$

$$Expected\ value\ V = \frac{\frac{1}{4}}{1 - \frac{3}{4} * \pi} * 0 + \left(1 - \frac{\frac{1}{4}}{1 - \frac{3}{4} * \pi}\right) * \frac{2}{3}$$

This expected value V should be lower compared to the second-last value V in the model which is V= 1/3. If the expected value V in case of pure strategy M=0 is higher than V=1/3 it pays off to chance strategy. The accounting company only expects a strategic message of M=0. By sending message

M=1/3 that message will therefore automatically be believed. Therefore the pure strategy M=0 only holds when:

$$\frac{\frac{1}{4}}{1-\frac{3}{4}*\pi}*0+\left(1-\frac{\frac{1}{4}}{1-\frac{3}{4}*\pi}\right)*\frac{2}{3}<\frac{1}{3}$$

$$\left(1-\frac{\frac{1}{4}}{1-\frac{3}{4}*\pi}\right)*\frac{2}{3}<\frac{1}{3}$$

$$\frac{\frac{1}{4}}{1-\frac{3}{4}*\pi}>\frac{1}{2}$$

$$\frac{1}{2}>1-\frac{3}{4}*\pi$$

$$\frac{1}{2}<\frac{3}{4}*\pi$$

$$\boldsymbol{\frac{2}{3}<\pi}$$

This means that only when the chance a client sends a strategic message is less than 1/3 a pure strategy of sending message M=0 will hold. When the chance that a client will send a strategic message is higher than 1/3 a mixed strategy will occur.

The equilibrium in a mixed strategy.

Before calculating the mixed strategy the term mixed strategy needs to be clear. A mixed strategy appears when a sustainable equilibrium is reached. This is the case when more than one strategy, in this model a sending message, leads to the same expected equilibrium value (Harsanyi, 1973)**.** In a mixed strategy there is an equilibrium when there is no incentive to deviate, which is only possible with a specific ratio. In this paper a mixed strategy appears when there is a chance that a client will send a strategic signal of M=1/3. The ratio represents the chance of sending either message M=0 or M=1/3. Sometimes there are more than two options in a mixed strategy equilibrium, but for this paper that is irrelevant. The ratio will lie between 0 and 1, above this value there would appear a pure strategy.

To examine the mixed strategy extra variables need to be added to the already existing variables, these variables are described below:
- α: the chance a strategic message will be M=0, the mixed strategy ratio.
- (1-α): the chance a strategic message will be M=1/3
- γ: the chance that V=1/3 while the message M=1/3 is send, P(V=1/3 | M=1/3)
- (1-γ): the chance that V≠1/3 while message M=1/3 is send

Now the term mixed strategy is clear the mixed strategy will be examined. For a stable equilibrium under mixed strategy it is necessary that the expected value V of the messages are the same for either M=0 and M=1/3 this way there is no incentive to deviate. The β is a result of the equation P(V=0 l M=0). This equation is basically the same as in the case of a pure strategy only the variable α is added. The numerator of the equation is exactly the same. The denominator is different. It would be irrational to send a higher message compared to the actual message. Therefore there is a distinction between the chance that a strategic messages is send by a V=0 client compared to the chance that clients with another values V send a strategic message. The variable α will be 1 for all the strategic messages send by the V=0 clients, but this does not count for the other strategic messages. This leads to the fact that ¼th of the strategic messages will not be multiplied by α but by 1. This because ¼th of these messages were send by a V=0 company. The other ¾th of the chance to send a strategic message needs to be multiplied by α. This leads to a β of:

$$P(V=0|M=0)=\beta=\frac{\frac{1}{4}*\pi+\frac{1}{4}*(1-\pi)}{\frac{1}{4}*\pi+\frac{1}{4}*(1-\pi)+\frac{3}{4}*(1-\pi)*\alpha}$$

$$\boldsymbol{\beta} = \frac{\frac{1}{4}}{\frac{1}{4} + \frac{3}{4} * \boldsymbol{\alpha} - \frac{3}{4} * \boldsymbol{\alpha} * \boldsymbol{\pi}} \quad (1)$$

The expected value V in case of a message M=0 is calculated with the same equation as before when examining the stability of the pure strategy. This was:

$$Expected\ value\ V\ when\ M\ is\ 0 = \ \beta * 0 + (1 - \beta) * \frac{2}{3}$$

$$Expected\ value\ V\ when\ M\ is\ 0 = \frac{\mathbf{2}}{\mathbf{3}} - \frac{\mathbf{2}}{\mathbf{3}} * \boldsymbol{\beta} \quad (2)$$

This expected value V has to be the same as the expected value V when M is 1/3. First γ needs to be examined. The γ is also based on Bayer's rule, with P(V=1/3|M=1/3). This stands for the chance that the actual value V is V=1/3 given that the message M=1/3 is send. The nominator of the equation is the chance that a client sends message M=1/3 and does actually have a value V of 1/3 as well. The nominator is divided in two parts. First part is the chance that a client is honest and signals M=1/3, which is ¼th multiplied by the chance that a client sends a honest message. The second part is the chance that a client sends a strategic message M = 1/3 and actually does have a value V= 1/3, which is ¼th multiplied by the chance that a client sends a strategic message. However part of the strategic companies with V=1/3 can signal M=0, so therefore it needs to be corrected by multiplying it with (1-α). The denominator is formed by the total chance that the signal M=1/3 is given. This again is divided in two parts. First part is the chance that a client, with V=1/3, sends an honest message. This is ¼th multiplied by the chance that a client sends an honest message. Second part is the chance that a strategic client signals M=1/3. Still a V=0t client always sends message M=0, both when a message is honest or strategic. This results in a possible chance that a client will send of ¾. This leads to:

$$P\left(V = \frac{1}{3} \middle| M = \frac{1}{3}\right) = \ \gamma = \frac{\frac{1}{4} * \pi + \frac{1}{4} * (1 - \pi) * (1 - \alpha)}{\frac{1}{4} * \pi + \frac{3}{4} * (1 - \pi) * (1 - \alpha)}$$

$$\boldsymbol{\gamma} = \frac{\frac{\mathbf{1}}{\mathbf{4}} - \frac{\mathbf{1}}{\mathbf{4}} * \boldsymbol{\alpha} + \frac{\mathbf{1}}{\mathbf{4}} * \boldsymbol{\alpha\pi}}{-\frac{\mathbf{2}}{\mathbf{4}} * \boldsymbol{\pi} + \frac{\mathbf{3}}{\mathbf{4}} - \frac{\mathbf{3}}{\mathbf{4}} * \boldsymbol{\alpha} + \frac{\mathbf{3}}{\mathbf{4}} * \boldsymbol{\alpha\pi}} \quad (3)$$

The expected value V when the message M=1/3 is given results in the following: with a chance γ the value V=1/3 is the actual value, but with a chance (1-γ) the value is not V=1/3. The expected value V when V is actually not V=1/3 can be calculated with the help of the distribution of V. The distribution of V is divided in four different V's. The V=0 was already captured in the message M=0, therefore V=0 is not playing any role for the expected value V given M=1/3. The value V=1/3 is captured because

you multiply γ with V=1/3. Therefore only value V=2/3 and value V=1 determine the expected value V when V≠1/3 given M=1/3. The expected value V is 2/3 +1 = 5/3 divided by 2. This gives an expected value V of 5/6. This expected V needs to be multiplied with the chance (1-γ).
The total expected value V when message M=1/3 is given therefore results in:

$$Expected\ V\ when\ M\ is\ 1/3 = \frac{1}{3} * \ \gamma + (1-\gamma) * \frac{5}{6}$$

$$Expected\ V\ when\ M\ is\ 1/3 = \mathbf{\frac{5}{6}} - \mathbf{\frac{3}{6}} * \boldsymbol{\gamma} \quad (4)$$

The expected values V need to be equal in a mixed strategy equilibrium. This gives the following equation:

$$\frac{2}{3} - \frac{2}{3} * \beta = \frac{5}{6} - \frac{3}{6} * \gamma \qquad (2) = (4)$$

$$-\frac{2}{3} * \beta - \frac{1}{6} = -\frac{3}{6} * \gamma$$

$$\frac{\mathbf{4}\boldsymbol{\beta} + \mathbf{1}}{\mathbf{3}} = \boldsymbol{\gamma} \quad (5)$$

This expression is equal to the previous defined formula for γ, which gives:

$$\frac{4\beta + 1}{3} = \frac{\frac{1}{4} - \frac{1}{4} * \alpha + \frac{1}{4} * \alpha\pi}{-\frac{2}{4} * \pi + \frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi} \qquad (5) = (3)$$

$$\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi = \left(-\frac{1}{2} * \pi + \frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi\right) * (4 * \beta + 1)$$

$$\frac{\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi}{-\frac{1}{2} * \pi + \frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi} - 1 = 4 * \beta$$

$$\frac{\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi}{-2 * \pi + 3 - 3 * \alpha + 3 * \alpha\pi} - \frac{1}{4} = \beta \qquad (6)$$

This expression is equal to the previous defined formula for β, which gives:

$$\frac{\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi}{-2 * \pi + 3 - 3 * \alpha + 3 * \alpha\pi} - \frac{1}{4} = \frac{\frac{1}{4}}{\frac{1}{4} + \frac{3}{4} * \alpha - \frac{3}{4} * \alpha * \pi} \qquad (6) = (1)$$

$$\frac{\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi}{-2 * \pi + 3 - 3 * \alpha + 3 * \alpha\pi} = \frac{1\frac{1}{4} + \frac{3}{4} * \alpha - \frac{3}{4} * \alpha\pi}{1 + 3 * \alpha - 3 * \alpha\pi}$$

$$\left(\frac{3}{4} - \frac{3}{4} * \alpha + \frac{3}{4} * \alpha\pi\right) * (1 + 3 * \alpha - 3 * \alpha\pi) = (-2 * \pi + 3 - 3 * \alpha + 3 * \alpha\pi) * \left(1\frac{1}{4} + \frac{3}{4} * \alpha - \frac{3}{4} * \alpha\pi\right)$$

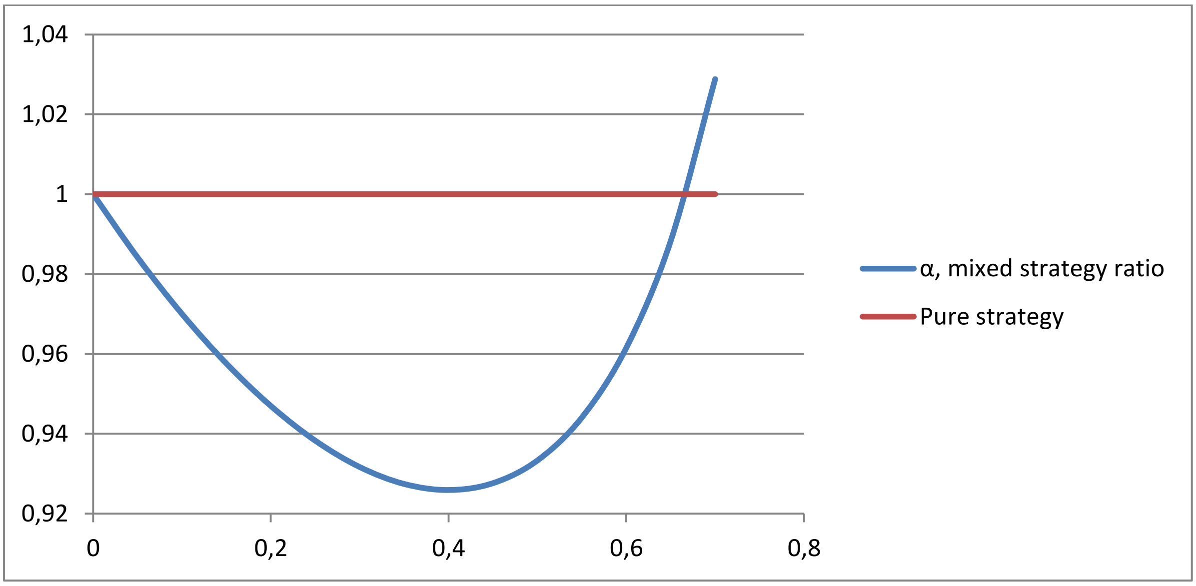
$$\frac{3}{4} + \frac{9}{4} * \alpha - \frac{9}{4} * \alpha\pi - \frac{3}{4} * \alpha - \frac{9}{4} * \alpha^2 + \frac{9}{4} * \alpha^2\pi + \frac{3}{4} * \alpha\pi + \frac{9}{4} * \alpha^2\pi - \frac{9}{4} * \alpha^2\pi^2 = -2\frac{1}{2} * \pi + 3\frac{3}{4} + 3\frac{3}{4} * \alpha\pi - 3\frac{3}{4} * \alpha - 1\frac{1}{2} * \alpha\pi + \frac{9}{4} * \alpha + \frac{9}{4} * \alpha^2\pi - \frac{9}{4}\alpha^2 + \frac{6}{4} * \alpha\pi^2 - \frac{9}{4} * \alpha\pi - \frac{9}{4}\alpha^2\pi^2 + \frac{9}{4}\alpha^2\pi$$

$$3 + 6 * \alpha - 9 * \alpha^2\pi^2 + 18 * \alpha^2\pi - 9 * \alpha^2 - 6 * \alpha\pi = -9 * \alpha^2\pi^2 + 6 * \alpha\pi^2 + 18 * \alpha^2\pi - 9 * \alpha^2 - 6 * \alpha - 10 * \pi + 15$$

$$\alpha(6 * \pi^2 + 6 * \pi - 12) = 10\pi - 12$$

$$\boldsymbol{\alpha = \frac{5 * \pi - 6}{3 * \pi^2 + 3 * \pi - 6}} \qquad (7)$$

This alpha describes the mixture in the equilibrium. When alpha is one, or more there is a pure strategy of sending message M=0 for all strategic message. This is when the π is 2/3 or higher or when the π=0. The path of the equilibrium is shown in the graph on the next page.



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The X-axis represents the π.

The accounting companies can learn from this graph that not only the lowest message M=0 contain strategic clients. On the other hand never more than 7.4 percent chance a strategic messages will be M=1/3, this is when the π=0.40 which gives the lowest point of alpha. The alpha is a flat U-shaped function. The reason why the alpha is rising again when the chance of sending a strategic message goes up can be best explained with the function of the expected value V when M is 1/3, this function is:

$$Expected\ V\ when\ M\ is\ 1/3 = \frac{1}{3} * \gamma + (1-\gamma) * \frac{5}{6}$$

The π drops below 0.40, this means that the chance a client is sending a strategic message is above 60 percent. This will lead to a low chance that V=1/3 given that M=1/3. Therefore the $(1-\gamma)$ is high. $(1-\gamma)$ is multiplied by 5/6 and raises the expected value V really fast. When comparing this with the expected value V when M is 0 it is clear that the expected value V will rise less fast. This can be explained with the formula for the expected value V when M is 0, which is given below:

$$Expected\ value\ V\ when\ M\ is\ 0 = \beta * 0 + (1-\beta) * \frac{2}{3}$$

When the same process happens, so the π drops below 0.40, the chance a client sends a strategic message is above 60 percent. Therefore $(1-\beta)$ is high. But this figure is multiplied with 2/3 or 4/6, which is obviously less compared to 5/6. That is the reason the expected value V when M is 0 will rise less fast. Therefore the chance of sending the message M=0 above M=1/3 will rise again when the chance of sending a honest signal drops below 40 percent. In the case of a 100 percent chance of sending a strategic message the expected value V when M is 1/3 will be influenced by $(1-\gamma)$*5/6 with such an extent that it will no longer pay off to send message M=1/3. The chance (1-γ) on 5/6 together with the chance γ on 1/3 creates in this case a higher expected value V compared to the chance (1-β) on 2/3 together with the chance β on 0. Sending message M=1/3 would therefore be irrational because it will lead to a higher expected value V which creates a higher equilibrium price.

With the equation for the alpha it is possible to find the beta. The beta leads to the expected V and the expected V on its turn is equal to the equilibrium price. The expected V equals the equilibrium price because of the Bertrand equilibrium in this market. To find the beta we have to fill in the alpha in the formula for the beta. This results in:

$$\frac{\frac{1}{4}}{\frac{1}{4}-\frac{3}{4}*\pi\left(\frac{5*\pi-6}{3*\pi^2+3*\pi-6}\right)+\frac{3}{4}*\left(\frac{5*\pi-6}{3*\pi^2+3*\pi-6}\right)}= \beta \qquad (1)+(7)$$

$$\frac{\frac{1}{4}}{\frac{1}{4}+\frac{-15\pi^2+18\pi+15\pi-18}{12\pi^2+12\pi-24}}=\beta$$

$$\frac{\frac{1}{4}}{\frac{12\pi^2+12\pi-24-60\pi^2+72\pi+60\pi-72}{48\pi^2+48\pi-96}}=\beta$$

$$\frac{12\pi^2+12\pi-24}{-48\pi^2+144\pi-96}=\beta$$

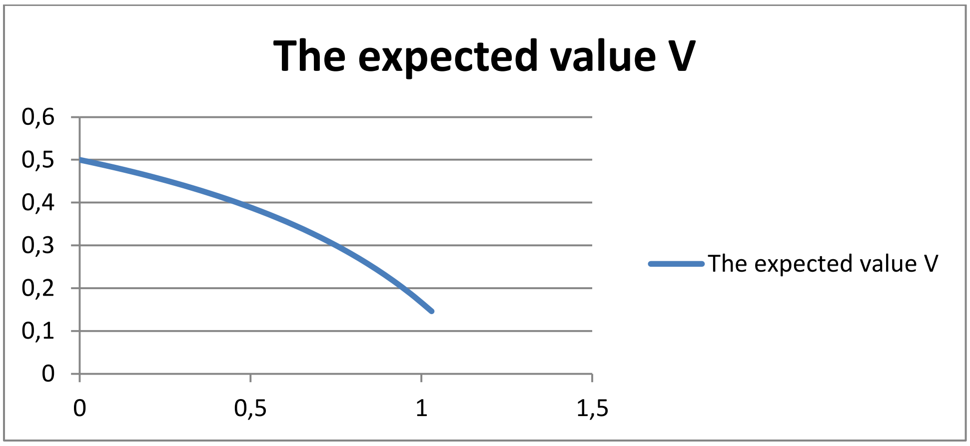
$$\boldsymbol{\frac{\pi^2+\pi-2}{-4\pi^2+12\pi-8}=\beta} \qquad (8)$$

The expected value V is a function of the chance to send a strategic message. This function is given by filling in the beta in the formula for the Expected value V when M is 0. This gives the following:

$$The\ expected\ value\ V = \frac{2}{3}-\frac{2}{3}*\left(\frac{\pi^2+\pi-2}{-4\pi^2+12-8}\right) \qquad (2)+(8)$$

$$The\ expected\ value\ V = \frac{2}{3} - \frac{\pi^2 + \pi - 2}{-6\pi^2 + 18\pi - 12}$$

This formula does not hold when the π is one because it is not possible to divide through zero. In that case there is no chance on a strategic message. Therefore every message contains the actual V. Furthermore the function for the expected value V only counts for all messages M=0 and M=1/3 when a mixed strategy occurs. A mixed strategy occurs when the chance on an honest message lies between 0 and 2/3, as shown in the graph of alpha. All the messages that send M=2/3 or M=1 will have an expected value V equal to the message, because these clients send an honest message. The graph below will show how the expected value V will develop under the chance of sending an honest message by the client.



The X-axis represents the π.

Limitations model

In the model there are four different client types, these types represent the time needed to have the controlling services completed. If instead of 4 types for example 10 types were used the mixture of the equilibrium would be more refined. The lack of refinement is a limitation of the model. Probably the pure strategy would not hold until $\pi=2/3$. Also the mixed strategy would probably consist out of more than two strategies. Although the model lacks some refinement the basic idea of the role of asymmetric information is easier to show with the model in this paper.

Another limitation of the model is the fact that the accounting companies are expected to be the same and work with the same efficiency, this assumption is necessary to work with the model.

The assumption that the accounting companies only have the initial information about the distribution of V is also a limitation of the model. Accounting companies not bind. They do have a judgement about the time needed for a controlling service. But many scandals on the accountancy market occurred and part of them were based upon the fact that accounting companies misinterpreted the time needed to fulfill the service correctly. The complicity of for example the Vestia case was underestimated. Complicity of the service is unknown or cannot really be interpreted by the accounting company. Therefore the judgement of the accountant is left out of the model.

Conclusion

The Dutch government is going to implement new regulations on the market for accounting services. The controlling accountant is not allowed fulfill his services at the same company for more than 8 years anymore. The circulation of the controlling accountant create a new problem. The relationship between the client and the accounting company cannot grow too tight. Therefore the reputation that leads to an honest and long-lasting relationship between the two players in the market is less valuable. Furthermore there is asymmetric information in the market for accounting services. Because of previous contracts clients know the time that needs to be spend before the controlling accounting service will be completed. On the other hand accounting companies do not know this time. The asymmetric information under the new circulation law is therefore creating an opportunity to lower the price for a controlling accountant service contract. In that case strategic clients pay less. This is done by the client through sending a strategic message instead of an honest message. The message of a client will lead to an expected time needed to complete the accounting service, this is called an expected value V. The benefit of the strategic use of the information depends upon the chance that a client will send a strategic message. The lower the chance on a strategic message the lower the expected value of this strategic message is. The expected value V leads to the equilibrium price for the controlling service, charged by the accounting company. Therefore the lower the chance on a strategic message the lower the price will be when a strategic message is send. Besides the expected value V there is also an actual value which represents the time an accounting company actually needs to fulfill the controlling service at a client. This is divided in 4 different times, namely; V=1, V=2/3, V=1/3 and V=0. Value V=0 represents clients with the lowest time needed to fulfill the accounting services and value V =1 is the highest. The chance on a strategic message does also influence whether the strategic message is a pure or mixed strategy. Clients do have a monetary incentive to change from an honest message into a strategic message. The monetary incentive exists because when a company is V=2/3 or V=1 there is always a benefit in choosing strategically. This goes on until all messages are strategically. In that case the pure strategy M=0 occurs and the expected value V is 0.5.

<u>How the use of asymmetric information affects the players in the model.</u>

In a pure strategy only the client with V=0 are worse off. It overpays for the controlling accounting service because it faces a higher expected value compared to V=0. When the actual V of a client not equal to zero it can send a strategic message which benefits the company. A strategic message is send with a certain chance represented by (1-π). When (1-π) rises above 33.3% the pure strategy does no longer hold, therefore a mixed strategy appears. Only in the case of 100% chance on a strategic message the pure strategy M=0 will hold again. The V=1/3 clients will also be worse off and overpaying in the case off a mixed strategy. They will also be worse off and overpaying when there is a 100% chance of sending a strategic message. Overpaying for the controlling accounting service happens when the expected value V is higher compared to the actual value V. The V=2/3 or V=1 will always be better off when sending a strategic message. This model shows that the strategic use of asymmetric information leads to the fact that the client with a low V overpays. On the other hand the client with a high V can benefit and pays less than it actually should. Therefor the lower V clients will partly pay for the higher V clients.

The accounting company is neither better nor worse off. When the price is too high the accounting company makes a profit. On the other hand when it charges not enough because the expected value V is lower compared to the actual value V the accounting company makes a loss. The eventual result will be zero, like the Bertrand model already explained.

Recommendations

Three main questions appear at the end of this paper. These three questions are in need to be examined further.
First the model found a monetary incentive to choose a strategic message for a company with a high V. This paper is focusing more on the equilibrium price and not on the chance that a client will send a strategic message. Therefore it is good to examine what the exact chance will be that a client sends a strategic instead message of a honest one. This can be done best with an empirical research where signals of clients are compared with the actual time spend to complete the accounting controlling service correctly.
Second this paper found a negative relationship between total time spend to fulfill the service and price paid per hour for this service. This finding seems to be unfair for companies that need only little time for the controlling service to be done. To solve this unfairness the accounting companies should have a clearer view of the criteria are that determine the time needed to complete a controlling service at the company. Therefore these criteria should be examined. With this knowledge the accounting company can better adjust the equilibrium price for a contract to the actual value of the contract. The asymmetric information in this market will therefore become smaller, which results in a fairer market price for the companies with a smaller V.
Third is found that the accounting companies overall do not make a profit or a loss. But in specific contracts an accounting company can make a loss. This is when the price charged by the accounting company is lower compared to the costs. The reaction of the accounting company can be that is will lower the quality of the control at that company. By lowering the quality it wants to lower the costs. In this event there appears a new problem on the market for accounting services. The quality of the control is important. A bad quality will again lower the trust in the accounting signature (Rezaee, 2004). The trust is needed to have an efficient working financial market (Boot & Soeting, 2003), as already said in the introduction. Therefore further research is needed to examine whether an accounting company will lower its quality when a contract will turn out on a loss. When actually is found that the quality will drop in case of a loss in a specific contract the solution is again to decrease asymmetric information. In that case the price charged for a contract will be closer to the actual costs for this contract.

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