Risk Attitude and Corporate Investment under Output Market Uncertainty: Evidence from The Mekong River Delta, Vietnam

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Abstract

This paper aims to detect the impact of firm managers' risk attitude on the relationship between the degree of output market uncertainty and firm investment. The findings show that there is a negative relationship between these two aspects for risk-averse managers while there is a positive relationship for risk-loving ones, since they have different utility functions. Based on the findings, this paper proposes recommendations for firm managers to take into account when making investment decisions and long-term business strategies as well.

Keywords: Competition; corruption; investment; market uncertainty; risk attitude.

1. Introduction

Investment is crucial to the development of firms since it helps enhance product quality and increase market share. Thus, good investment decisions will raise firms' efficiency and then trigger economic growth (Maki et al., 2005). However, making right investment decisions is basically difficult, due to the output market uncertainty facing firm managers, among others (e.g., competition and financing constraints).

As well perceived, investment decisions are much dependent on firm managers' risk attitude toward output market uncertainty (Bo and Sterken, 2007; Femminis, 2008). Being skeptical about the loss that may result from poor investment decisions, risk-averse managers tend to postpone investment intents so as to acquire more relevant information. In this situation, they possibly forgo good investment opportunities. On the other hand, risk-loving managers who are normally over-optimistic about their own competence and market prospect will proceed with investment opportunities, irrespective of their uncertain outcomes. This tendency is accentuated by successes in the past. Such over-optimistic behaviour may be problematic if output markets would somehow turn worse. Thus, investment decisions of both risk-averse and risk-loving managers seem to have drawbacks that should be avoided.

The aim of this paper is to examine the impact of managers' risk attitude on investment by non-state firms in the Mekong River Delta (MRD) under output market uncertainty. Findings of this paper will lay down a credible ground for recommendations that enable firms to make better investment decisions and proper long-term business strategies. This paper is structured as follows. Section 1 introduces the paper. Section 2 gives a review of the related literature. Section 3 defines the empirical model out of the literature reviewed. Section 4 discusses the findings using a set of primary data on 667 non-state firms in the MRD. Section 6 concludes the paper and renders recommendations.

2. Literature review

When making investment decisions, firm managers do face output market uncertainty. To put it differently, they do not know the exact future sales. Thus, they tend to postpone investment in order to fetch more relevant information and determine the right time to invest (Berk, 1999). According to Nishihara and Shibata (2014), unless firms have to invest to preempt competitors, most investment projects can be postponed, since for most of the time, investment opportunities remain for a certain period prior to absolutely expiring. Indeed, having an investment opportunity (a real option) is analogous to owning a European call option to buy a stock. Then, the owner can exercise it right away, or later, to get a financial asset with a certain value (e.g., a stock). When possessing a real option (i.e., an investment opportunity), the firm can decide to invest right away or at any future point of time to obtain a real asset with a certain value (e.g., a factory). Like call options, the value of real options stems from the managerial flexibility in making use of the uncertainty about the future value of the real asset (Luehrman, 1998). Due to uncertainty, firm managers tend to wait for more information that helps to avoid failure.

Thus, researchers have tried to examine the impact of output market uncertainty on firm

investment. Most of the empirical studies on this topic (Guiso and Parigi, 1999; Ghosal and Loungani, 2000; Le, Hermes and Lanjouw, 2004) came up with evidence of negative relationships between the uncertainty and firm investment. According to them, the higher the degree of output market uncertainty, the lower the level of investment, due to the fact that uncertainty may increase the user cost of investment. A higher degree of uncertainty also makes firm managers cautious in taking up investment projects because, in that case, it is hard to control and mitigate the adverse impact of market gyrations. As a result, investment will decline. However, these studies have ignored firm managers' risk attitude or implicitly assumed that their risk attitude is virtually identical.

As a matter of fact, firm managers would belong to either risk-averse or risk-loving group of people, due to differences in utility and motivation, among others (Block et al., 2015). Thus, researchers started to examine the relationship between managers' risk attitude and firm investment. For them, investment decisions of managers are normally aimed at maximizing expected profits rather than actual ones. Then, the utility function $U(\pi)$ of a risk-averse manager is a concave curve of profit π, because of the law of diminishing marginal utility. On the other hand, the utility function $U(\pi)$ of a risk-loving manager is a convex curve of profit π, due to the law of increasing marginal utility. As a result, investment decisions by those groups of managers largely diverge.

Different from those studies that just focus on single aspects of relevant issues (such as output market uncertainty, risk attitude, competition or financing constraints), recent studies pay attention to full-fledged investment decisions, thanks to the inevitable assertion that output market uncertainty affects investment via the channel of managers' risk attitude (Nakamura, 1999; Bo and Sterken, 2007; Femminis, 2008; Chronopoulos et al., 2011; Whalley, 2011; Aistov and Kuzmicheva, 2012). According to them, risk-loving managers tend to accelerate investment as the degree of uncertainty goes up because of self-confidence, ambition to get over challenges and sanguineness about the future. For those managers, the satisfaction resulting from a success surely dominates the disappointment of failing. Thus, a higher degree of uncertainty will induce them to invest more.

On the other hand, risk-averse managers who do prefer certain values to uncertain ones will opt for investment projects with more certain profits. In terms of utility, risk-averse managers feel worse off if losing more, than better off if winning. Being skeptical about losing, they need time to acquire more relevant information before making investment decisions so as to minimize the possibility of failure and regret. Thus, investment will drop as the degree of output market uncertainty picks up. In other words, the relationship between output market uncertainty and investment depends on firm managers' risk attitude.

3. Empirical model

Given the argument previously presented, the empirical model used to detect the impact of managers' risk attitude on the relationship between the degree of output market uncertainty and firm investment is specified as follows:

$$INV_i = \beta_0 + \beta_1 UNCER_i + \beta_2 UNCER_i \text{ x } RISK_i + \beta_3 RISK_i + \varepsilon_i \quad (1)$$

In Model (1), INV_i is the ratio of planned investment in machinery, land and buildings to total fixed assets of firm *i*. $UNCER_i$ is the degree of output market uncertainty, measured by the coefficient of variation of expected sales of firm *i* (Guiso and Parigi, 1999; Le, Hermes and Lanjouw, 2004).[1] Coefficient β_1 is expected to be negative since the theory postulates that output market uncertainty may have a negative impact on firm investment.

$RISK_i$ is used to proxy for risk attitude of the top manager of firm *i*. To construct this variable, the manager was asked to choose between two hypothetical cases: (i) investing a certain amount of money to earn 10% profit for sure or (ii) investing the same amount of money to earn 20% profit with a probability of 50% or nothing with the remaining probability of 50%. $RISK_i$ takes a value of 0 (risk-averse) for the manager who chooses case (i) and 1 (risk-loving) for the one choosing case (ii). The previous empirical studies proved that risk-loving managers tend to invest more as the degree of output market uncertainty increases (Antonides and Van der Sar, 1990; Driver and Whelan, 2001; Andrade and Stafford, 2004; Akdoğu and Mackay, 2008). Therefore, coefficient β_3 is supposed to be positive.

$UNCER_i$ x $RISK_i$ is an interaction of $UNCER_i$ and $RISK_i$. This interactive term is used to detect the impact of managers' risk attitude on the relationship between output market uncertainty and investment of firm *i*. Studies (Bo and Sterken, 2007; Femminis, 2008; Chronopoulos et al., 2011; Whaley, 2011; Aistov and Kuzmicheva, 2012) argue that there is a negative impact of managers' risk attitude on the relationship between the degree of uncertainty and investment for risk-averse managers. For those managers, since $RISK_i = 0$ then $\partial INV_i / \partial UNCER_i = \beta_1$. Thus, it is expected that $\beta_1 < 0$. For risk-loving managers, there is a positive impact. For those, since $RISK_i = 1$ then $\partial INV_i / \partial UNCER_i = \beta_1 + \beta_2$. Therefore, β_2 is supposed to be positive and $|\beta_2| > |\beta_1|$. ε_i is an error term.

To be complete, the empirical model should include the determinants of investment identified by other studies (Bo and Lensink, 2005; Guiso and Parigi, 1999; Polder and Veldhuizen, 2012), such as retained profit, growth rate of sales, degree of competition, etc. Given these factors, the empirical model of this paper then becomes:

$$INV_i = \beta_0 + \beta_1 UNCER_i + \beta_2 UNCER_i \text{ x } RISK_i + \beta_3 RISK_i + \beta_4 PRO_i + \beta_5 IRR_i + \beta_6 DSAL_i + \beta_7 COMP_i + \beta_8 COMP_i^2 + \beta_9 FAGE_i + \beta_{10} BRI_i + \beta_{11} BRI_i^2 + \beta_{12} FSIZE_i + \beta_{13} MANU_i + \beta_{14} SERV_i + \varepsilon_i \quad (2)$$

PRO_i is the ratio of after-tax profits to total assets of firm *i*. Bo and Lensink (2005) and Bayraktar (2014) argue that, in the case of credit rationing due to information asymmetry, transaction cost and limited liability, firm investment is largely related to internal finance (mainly retained profits) because of difficulties in getting access to external finance (e.g., bank credit). Therefore, coefficient β_4 is thought to be positive.

IRR_i is a proxy for the irreversibility of used assets of firm *i*. Managers of the surveyed firms were asked to evaluate the possibility to resell used assets in order to construct variable $IRR1_i$, which takes a value of 1 if the answer is "easy" and 0 if the answer is "not easy". We also use the information about the expected resell value

of used assets to construct variable $IRR2_i$ (i.e., the ratio of the expected resell value of used assets to their replacement cost). Since the irreversibility of used assets depends on both $IRR1_i$ and $IRR2_i$ (Guiso and Parigi, 1999), we utilize the principal component technique to combine these two variables to create $IRR_i = w_1 IRR1_i + w_2 IRR2_i$, with w_1 and w_2 being component parameters. The higher the value of IRR_i, the higher the possibility for firms to resell used assets. Since investment decisions are normally hard to reverse (either partially or totally), a higher possibility to resell used assets induces firms to invest more, other things being equal. Coefficient β_5 is then expected to be positive.

$DSAL_i$ is the annual growth rate of sales by firm i (%). A fast growth of sales means a better prospect for firms. Therefore, firms will embark on more investment to make use of good available opportunities (Guiso and Parigi, 1999; Bo and Sterken, 2007). As a result, coefficient β_6 is supposed to be positive.

$COMP_i$ is the degree of competition facing firm i, measured by its profit elasticity (PE_i). PE was coined by Boone (2000) and further developed by Boone (2001, 2008), Polder and Veldhuizen (2012), etc. According to those studies, the degree of competition can be identified by the ratio of percentage change of profit (π) to percentage change of marginal cost (MC), which means:

$$PE_i = \frac{\Delta\pi_i / \pi_i\ (\%)}{\Delta MC_i / MC_i\ (\%)}$$

Since it is often difficult to measure MC, researchers replace it by average cost (AC). In addition, the average cost of firms that operate in different sectors will be the ratio of total cost (TC) to total revenue (TR), because it is not plausible to add up the quantity of different goods (Polder and Velhuizen, 2012). In sum, PE_i can be written as follows:

$$PE_i = \frac{\Delta\overline{\pi}_i / \overline{\pi}_i\ (\%)}{\Delta AC_i / AC_i\ (\%)} < 0,\ \overline{\pi}_i = \pi_i / TR_i$$

As just explained, fierce competition may squeeze PE_i. Therefore, in order to make it easier to grasp the impact of the degree of competition on investment, we use $COMP_i = |PE_i|$. A higher value of $COMP_i$ means a higher degree of competition facing firm i. $COMP_i^2$ is also used to reveal the presence of an inverted-U shaped relationship between the degree of competition and investment by the firm. Nielsen (2002), Aghion et al. (2005), Moretto (2008), Akdoğu and Mackay (2008) and Polder and Veldhuizen (2012) assert that firms operating in a less severely competitive environment often have high costs due to moral hazard that results in inefficiency. As competition pressure strengthens, firms are forced to raise investment to mitigate costs, enhance efficiency and preempt competitors so as to tackle the risk of squeezed market share. Yet, if competition pressure goes beyond a certain point, it becomes too fierce, market niches evaporate and benefits from investing are no longer present, firms will then scale down investment. Thus, coefficient β_7 is expected to be positive and β_8 negative. $FAGE_i$ is the number of years in operation (age) of firm i. Since young firms are more eager to invest to grow and expand market share so as to avoid failing. Thus, β_9 is supposed to be negative (Hansen, 1992; Moohammad et al., 2014).

BRI_i is the ratio of bribes that firm i paid to public officials to its total assets. BRI_i^2 is included to detect the non-monotonic relation-

Table 1: Summary of the signs of the coefficient of independent variable

Variables	Definitions/Measures	Signs of the coefficients of independent variables
$UNCER_i$	Degree of output market uncertainty, measured by the coefficient of variation of expected sales of firm *i*	Negative
$RISK_i$	Being 0 for risk-averse managers and 1 for risk-loving ones	Positive
$UNCER_i$ x $RISK_i$	Interaction of $UNCER_i$ and $RISK_i$	Positive
PRO_i	Ratio of after-tax profits to total assets of firm *i*.	Positive
IRR_i	A proxy for the irreversibility of used assets of firm *i*	Positive
$DSAL_i$	Annual growth rate of sales by firm *i* (%)	Positive
$COMP_i$	Degree of competition facing firm *i*, measured by its profit elasticity (PE_i)	Positive
$COMP_i^2$	Square of $COMP_i$	Negative
$FAGE_i$	Number of years in operation of firm *i*	Negative
BRI_i	Ratio of bribes that firm *i* paid to public officials to its total assets	Positive
BRI_i^2	Square of BRI_i	Negative
$FSIZE_i$	Logarithm of total assets of firm *i*	Positive/Negative
$MANU_i$	Being 1 for manufacturing firms and 0 otherwise	Positive/Negative
$SERV_i$	Being 1 for service firms and 0 otherwise	Positive/Negative

ship between bribes and investment by the firm. If bribed, bureaucratic officials are 'greased' to provide better services to firms, enabling them to take up available investment opportunities. However, despite bribes, some corrupt officials deliberately stay intact so as to force firms to bribe more. If forced to bribe too much, expected profits from investment projects will go down and firms will reduce investment accordingly. Therefore, there exists an inverted-U shaped relationship between bribes and firm investment (Svensson, 2005; Le Khuong Ninh, 2008). As a result, β_{10} is expected to be positive and β_{11} to be negative.

$FSIZE_i$ is the size of firm *i*, measured by the logarithm of the firm's total asset value. In fact, large non-state firms tend to be more conservative about making big investments since it is difficult to find good opportunities. Thus, β_{12} is thought to be negative (Hansen, 1992; Le Khuong Ninh et al., 2007; Akdoğu and MacKay, 2008).

$MANU_i$ and $SERV_i$ are used to test for the possible discrepancy of investment among firms in

different sectors (i.e., manufacturing, trade, and services). $MANU_i$ takes a value of 1 for manufacturing firms and 0 otherwise. $SERV_i$ takes a value of 1 for service firms and 0 otherwise. Coefficients β_{13} and β_{14} can be either positive or negative, depending on the environments in which the firms operate.

4. Data and estimation method

The primary data used in this paper were directly collected from 667 non-state firms in the MRD (Vietnam), using a questionnaire prepared in advance that had been corrected after several pilot surveys. Due to some reasons (such as being unable to contact the top manager, wrong address, missing information, etc.), we were able to get information from 667 non-state firms. The sample includes 42 firms in An Giang province (accounting for 6.3% of the total number of the surveyed firms), 24 in Bac Lieu (3.6%), 22 in Ben Tre (3.3%), 44 in Ca Mau (6.6%), 194 in Can Tho (29.1%), 43 in Dong Thap (6.5%), 53 in Hau Giang (7.9%), 43 in Kien Giang (6.5%), 52 in Long An (7.8%), 44 in Soc Trang (6.6%), 24 in Tien Giang (3.6%), 25 in Tra Vinh (3.7%) and 57 in Vinh Long (8.5%). The data collected include the information about general characteristics, performance, actual and planned investment by the firms, among others.

To give a full picture of the characteristics of the surveyed firms, we use descriptive statistics. Then, we utilize Tobit model to estimate the impact of managers' risk attitude on the relationship between the degree of output market uncertainty and investment by the surveyed firms.

5. Findings

5.1. Characteristics of the surveyed firms

According to the survey, the average age of the firms is 10 years and their average asset value is 146,913 VND million (Table 2). There are 231 liability-limited firms (accounting for 34.6% of the total number of firms surveyed), 193 joint-stock ones (28.9%), and 180 sole proprietorship ones (27%). There are 154 firms exporting part of or total output (accounting for 23.1% of total number of firms surveyed).

Average sales of the surveyed firms in 2013 is 210,402 VND million (increasing by 17.4% compared to that in 2012). Average profits of those firms are 16,761 VND million (increasing by 6.8% compared to that in 2012). However, their average costs went up markedly (by 18.4% compared to that in 2012). Return on

Table 2: General information about the surveyed firms (2013)

Indicators	Mean	Standard deviation	Min	Max
Age (year)	10	9	2	52
Total assets (VND million)	146,913	492,392	130	6,750,400
Sales (VND million)	210,402	539,048	50	5,450,131
Profit (VND million)	16,761	77,904	–705,087	1,200,000
Investment (VND million)	14,402	60,835	0	793,000

Source: Authors' survey in 2014.

Table 3: Investment by the firms

Financing sources	Investment in 2013		Planned investment in 2015		Change in 2015 compared to 2013 (%)
	Amount (VND million)	% of total	Amount (VND million)	% of total	
Equity	9,472.03	65.77	5,142.61	58.57	–45.71
Loans from joint-stock banks	2,976.26	20.66	2,169.25	24.71	–27.11
Loans from state banks	1,432.91	9.95	1,022.82	11.65	–28.62
Loans from foreign-owned banks	221.11	1.54	90.67	1.03	–58.99
Loans from government projects	30.58	0.21	19.34	0.22	–36.76
Others	269.51	1.87	335.13	3.82	24.35
Total investment	14,402.41	100.00	8,779.81	100.00	–39.04

Source: Authors' survey in 2014.

sales (ROS) of those firms was 8%. All this implies that the firms had reasonable growth rates but did not well utilize resources, so the costs are high.

About 46.3% of the surveyed firms paid bribes and the average bribe per firm is 192.2 VND million per year. Bribing seems to be pervasive as 45.6% of the firms did it on purpose to get things done faster and 48.5% saw it as an implicit norm. The firms bribed by giving gifts (accounting for 56.0% of total number of firms), travel (54.3%) or in cash (52.8%).

Average investment by the firms in 2013 is 14,402.4 VND million. Due to economic downturn and suppressed market demand, planned investment of the firms in 2015 is just 8,779.8 VND million (decreasing by 39.04% compared to that in 2013). Financing sources for investment by the firms are equity (mainly retained profits) and bank loans. According to the survey, equity is an important financing source of investment by the firms, which accounts for as much as 65.77% of total investment outlays of the firms in the sample. When making investment decisions, firm managers were also concerned with output market uncertainty. The coefficient of variation of the future sales of the firms is 37.7%.

Le, Hermes and Lanjouw (2004) also estimated the coefficient of variation of expected sales for firms in the MRD in 2000 and came up with a figure of 17.9%. This result implies that the degree of output market uncertainty facing firms in the region has gone up substantially. The reason for that is the economic downturn during the time our data were collected.

5.2. Estimation results

This section aims to examine the impact of managers' risk attitude on the relationship between the degree of output market uncertainty and investment by the surveyed firms. Before doing that, we carefully check the data for hypotheses on multicollinearity and heteroskedasticity. All coefficients between independent variables (r_{ij}) are smaller than 0,8 ($0{,}0002 \leq |r_{ij}| \leq 0{,}532$), proving that there is no multicollinearity effect. In addition, we have used the Robust estimation option in Stata to correct the

Table 4: Estimation results

Dependent variable: INV – planned investment in 2015

Variables	Model 2a	Model 2b	Model 2c
C	–0.038	–0.035	–0.024
	–	–	–
$UNCER_i$	–0.115*	–0.126*	–0.151**
	(–0.045)	(–0.048)	(–0.059)
$UNCER_i \times RISK_i$			0.215**
			(0.084)
$RISK_i$		0.085*	
		(0.035)	
PRO_i	0.252***	0.246***	0.251***
	(0.098)	(0.094)	(0.098)
IRR_i	0.045***	0.047***	0.048***
	(0.018)	(0.018)	(0.019)
$DSAL_i$	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)
$COMP_i$	0.005***	0.005***	0.005***
	(0.002)	(0.002)	(0.002)
$COMP_i^2$	–0.000**	–0.000**	–0.000**
	(–0.000)	(–0.000)	(–0.000)
$FAGE_i$	–0.002	–0.002	–0.002
	(–0.001)	(–0.001)	(–0.001)
BRI_i	7.375***	7.223***	6.972***
	(2.856)	(2.763)	(2.722)
BRI_i^2	–58.675*	–57.327*	–55.203*
	(–22.722)	(–21.929)	(–21.557)
$FSIZE_i$	–0.002	–0.002	–0.002
	(–0.001)	(–0.001)	(–0.001)
$MANU_i$	–0.006	–0.011	–0.011
	(–0.002)	(–0.004)	(–0.004)
$SERV_i$	–0.046	–0.050	–0.051
	(–0.017)	(–0.018)	(–0.019)
Observations (n)	667	667	667
F value	5.050	4.550	4.650
Significance	0.000	0.000	0.000
Log likelihood	–334.551	–332.607	–331.879

*Notes: In the first line is coefficient β_i. In the brackets is $\partial INV / \partial X_i$. ***: 1% significance level; **: 5% significance level; and *: 10% significance level.*

Source: Authors' survey in 2014.

problem of heteroskedasticity.

The impact of output market uncertainty on investment by the firms with managers' risk attitude being excluded (Model 2a) is presented in Table 4. The estimate shows that coefficient β_1 of $UNCER_i$ has a value of -0.115 at a significance level of 10%, implying that the degree of output market uncertainty has a negative

impact on investment by the surveyed firms. $RISK_i$ is added to Model 2b (Table 4) to estimate the impact of managers' risk attitude on investment, regardless of output market uncertainty. The coefficient of $RISK_i$ is 0.085 at a significance level of 10%. This would mean that risk-loving managers tend to investment more than risk-averse ones do, others being equal.

However, recent studies argue that there is an interaction between the degree of output market uncertainty and managers' risk attitude to influence firm investment. Therefore, Model 2c (Table 4) aims to find evidence for this argument. Indeed, coefficient β_2 of the interactive term $UNCER_i \times RISK_i$ has a value of 0.215 at a significance level of 5%. Obviously, risk-loving managers ($RISK_i = 1$) tend to invest more as the degree of output market uncertainty goes up, since $\partial INV_i / \partial UNCER_i = -0.059 + 0.084 = 0.025$ Yet, risk-averse managers ($RISK_i = 0$) tend to scale down investment as the degree of output market uncertainty picks up, since $\partial INV_i / \partial UNCER_i = -0.059$.

Coefficient β_4 of PRO_i has a positive value at a significance level of 1%, implying that retained profits have a positive impact on investment by the firms, since they are usually credit rationed by commercial banks. In addition, coefficient β_5 of IRR_i also has a positive value at a significance level of 1%, meaning that the easier it is to resell used assets, the higher the level of investment. Similarly, coefficient β_6 of $DSAL_i$ also has a positive value at a significance level of 1%. In addition, most coefficients of other variables have expected signs, except for those of $FAGE_i$, $FSIZE_i$, $MANU_i$, and $SERV_i$.

6. Conclusion and recommendations

The findings show that the impact of output market uncertainty on investment is negative if managers' risk attitude is not considered. This relationship becomes stronger for risk-averse managers since they need time to acquire more relevant information before making investment decisions so as to minimize the possibility of failure and regret. Yet, there exists a positive relationship between output market uncertainty and investment of risk-loving managers since they tend to accelerate investment as the degree of uncertainty goes up due to self-confidence, ambition to get over challenges and sanguineness about the future. In addition, the impacts of the degree of competition and bribes on firm investment both have the shape of an inverted-U. In addition, the higher the reversibility, the higher the investment by the firms.

As argued, investment decisions of both groups of managers (i.e., risk-averse and risk-loving) may bring about bad outcomes if the perceptions about the degree of output market uncertainty are not precise. To make good predictions of the future, firms should have an own unit that is in charge of forecasting market tendency that will help firm managers make better investment decisions. In addition, to a certain extent, firms should consider diversifying operations to mitigate risks resulting from market gyrations and using risk hedging instruments (such as forwards, futures and swaps). The Government can also consider establishing an agency specializing in providing market information to firms.

Notes:

1. From the data gathered, we are able to calculate the conditional mean ($CM = (1+d^e)\times S_0$) and variance ($CV = (\sigma^2)^e \times S_0^2$) of the growth rate of sales in 2015 as perceived in 2014 (S_0 is the sales in the base year (2013), d^e is the expected mean of the growth of sales in 2015 and $(\sigma^2)^e$ is the expected variance of the growth rate of sales in 2015). Based on those variables, we calculate the coefficient of variation of expected sales ($UNCER = \sqrt{CV}/CM$).

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