Estimation of financial loss ratio for E-insurance: a quantitative model*

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Abstract: In view of the risk of E-commerce and the response of the insurance industry to it, this paper is aimed at one important point of insurance, that is, estimation of financial loss ratio, which is one of the most difficult problems facing the E-insurance industry. This paper proposes a quantitative analyzing model for estimating E-insurance financial loss ratio. The model is based on gross income per enterprise and CSI/FBI computer crime and security survey. The analysis results presented are reasonable and valuable for both insurer and the insured and thus can be accepted by both of them. What we must point out is that according to our assumption, the financial loss ratio varied very little, 0.233% in 1999 and 0.236% in 2000 although there was much variation in the main data of the CSI/FBI survey.

Key words: Electronic commerce, Security, Financial loss ratio, Insurance
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INTRODUCTION

E-commerce security has drawn more and more attention among experts and common customers. While many people focus on security technologies (Jiang et al., 2000; Gupta et al., 2000), some people have moved over to the insurance industry from the technology area in order to improve E-commerce development (Burden, 2000; Geer, 1998; Kueter et al., 2000; Zhong, 1999; Zhong et al., 2000).

As far as the insurance service trade is concerned, traditional theory seem not applicable to today's E-commerce scenario. Both insurer and insured must estimate precisely the financial loss ratio (FLR) of E-commerce so that they can determine a reasonable pure premium ratio and coverage that both of them can accept. To my knowledge, there are no published models for quantifying these values. In this paper, the author proposes a model for estimating the FLR value.

E-risks, risks of E-commerce, result from insecurity of E-commerce. For example, people often regard public key infrastructure (PKI) as the important basis for secure E-commerce. But PKI also involves many risks. (Gollman, 2000; Ellision et al., 2000a, 2000b; Corell, 2000) In addition, "Inevitably, the rapid changes in business processes and strategies result in risks, which are not always simply 'commercial' risks so that the changes will not bring about the financial benefits which result from the electronic medium through which the business is conducted" (Burden, 2000). In general, risks exist a number of key areas associated with E-commerce and the use of the Internet, including the risks resulting from contractual and jurisdictional problems, data, technology, third parties, internal risks, content liability, etc.

In fact, many existing insurance products already provide a degree of cover for the risks noted above, and newly required forms of insurance cover include 'packaged' E-commerce cover, modular cover and amendments

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/ addendums to existing policies. That is the trend among USA and some west-European countries (Burden, 2000; Greenberg, 2000; Kueter et al., 2000). However, among a majority of developing country including China, E-commerce is still in its infancy and thus these kinds of insurance are almost unheard of or even considered, because there are no reasonable analyzing methods for E-insurance and insufficient supporting data.

The principle of insurance is to share risks. The base of insurance is to estimate precise loss ratio. However, it is usually difficult to simply estimate the quantitative risk of a new technology because there are no adequate and reliable statistical evidences on which to base a judgement. As far as E-insurance is concerned, the situation is even worse, because the technologies change very frequently.

We propose a comparison-based model to estimate the FLR of packaged E-insurance.

A MODEL FOR ESTIMATING FINANCIAL LOSS RATIO

Basic concepts and notation

Packaged E-insurance cover is an insurance policy that claims specifically to cover many of the risks discussed above.

FLR is financial loss ratio quantifying the loss resulting from risk of E-commerce insecurity.

Our comparison-based method for estimating FLR shows that we can choose the most similar area and not be limited to the E-commerce scenario as our research area. Obviously, we can research the FLR of computer crime and insecurity instead of the FLR of E-commerce insecurity.

The FLR in this paper is the financial loss ratio comparing to gross income per enterprise. Financial losses include all loss resulting from all kinds of computer crimes and incidents.

We select “CSI/FBI computer crime and security survey results”(1999; 2000), CSI/FBI survey for short, as primary data so that the analytic results are more convincing to both insurer and the insured.

Assumptions

(a) Amount of losses of each enterprise is in direct proportion to gross income, number of employees and insecurity accidents.

(b) Amount of losses of each non-profit organization is equal to a commercial one in equal number of employees.

(c) All kinds of probability are equal, comparing the responded and the not responded.

(d) All kinds of probability are equal, comparing the acknowledged to the not acknowledged.

(e) All kinds of probability are equal, comparing the quantifiable to the not quantifiable.

(f) All kinds of probability are equal, comparing the respondents who know to those who do not know.

Methodology and terms

1. FLR of commercial organization or non-commercial one

First, we must be aware that the *FLR* of commercial organization (company) is different from that of non-commercial one. From the CSI/FBI survey, we can know the company account for 69% of all respondents in 1999 and 65% in 2000.

On the one hand, we can estimate the value of the financial losses ratio per company (FLR_C) as follows.

$$FLR_C = \frac{L}{G} = \frac{L \div N_C}{G \div N_C} = \frac{\overline{L}_C}{G_C} \qquad (1)$$

where L is amount of losses , G is amount of gross income, N_C is number of company, L_C is average losses per company, and G_C is the average gross income per company among all respondent companies subject to all types of computer incidents.

On the other hand, we can estimate the following financial loss ratio per non-commercial organization (FLR_{NC}) based on assumptions (a), (b).

$$FLR_{NC} = \frac{L_O}{G_O} = \frac{L_O}{E_O \times G_E} \qquad (2)$$

where L_O is amount of losses per organization, G_O is gross income per organization, $\overline{E}_O$

is average number of employees per organization，and $\overline{G}_{\mathrm{E}}$ is average gross income per employee.

Because results of the CSI/FBI survey have not been partitioned into commercial organization and non-commercial one，we look uniformly on them as company，and regard respondent，company，and organization as one term in our paper if not specially pointed out. Thus，we think that

$$L_{\mathrm{O}} = L_{\mathrm{C}} \text{ and } FLR_{\mathrm{NC}} = FLR_{\mathrm{C}}$$

2. Average gross income per company（$\overline{G}_{\mathrm{C}}$）

$$\overline{G}_{\mathrm{C}} = \sum_{i=1}^{5} \frac{\max G_i + \min G_i}{2} \times a_i \qquad (3)$$

where $\max G_i$ is maximal gross income of class i of respondents，$\min G_i$ is minimal one，and a_i is percentage（see Appendix，Table 5）.

3. Average number of employees per organization（$\overline{E}_{\mathrm{O}}$）

$$\overline{E}_{\mathrm{O}} = \sum_{i=1}^{6} \frac{\max E_i + \min E_i}{2} \times b_i \qquad (4)$$

where $\max E_i$ is maximal number of employees of class i of respondents，$\min E_i$ is minimal one，and b_i is percentage（see Appendix，Table 6）. So，average gross income per employee is:

$$\overline{G}_{\mathrm{E}} = \frac{\overline{G}_{\mathrm{C}}}{\overline{E}_{\mathrm{C}}} = \frac{\overline{G}_{\mathrm{C}}}{\overline{E}_{\mathrm{O}}} \qquad (5)$$

where $\overline{E}_{\mathrm{C}}$ is average number of employees per company.

4. Average losses per company（$\overline{L}_{\mathrm{C}}$）

We can start with the following formula in order to calculate $\overline{L}_{\mathrm{C}}$.

$$\overline{L}_{\mathrm{C}} = \overline{L}_{\mathrm{I}} \times \overline{I}_{\mathrm{C}} \qquad (6)$$

where $\overline{I}_{\mathrm{C}}$ is average number of incidents per company and $\overline{L}_{\mathrm{I}}$ is average losses per incident.[*]

5. Average number of incident per company（$\overline{I}_{\mathrm{C}}$）. The term has several meanings（Fig.1）.

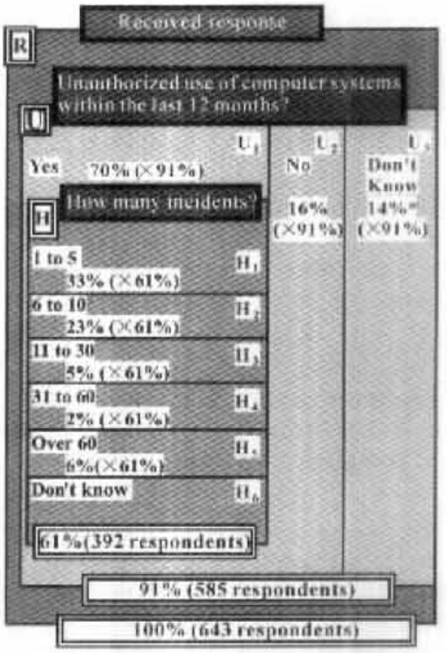

Fig.1 Incidents in 2000 survey

Source: CSI/FBI computer crime and security survey

* the datum in source is 12%，adjusted

（a）$\overline{I}_{\mathrm{C\text{-}1}}$: average number of incident per company among those respondents in area H_1，H_2，H_3，H_4 and H_5.

$$\overline{I}_{\mathrm{C\text{-}1}} = \sum_{i=1}^{5} \frac{\min I_i + \max I_i}{2} \times h_i \qquad (7)$$

where $\min I_i$ is minimal number of incidents detected by respondents，$\max I_i$ is maximal one，and h_i is percentage of class i in Table 8（Appendix）.

（b）$\overline{I}_{\mathrm{C\text{-}2}}$: average number of incidents per company among those respondents in the area H. According to assumption（f），

$$\frac{\overline{I}_{\mathrm{C\text{-}2}}}{\overline{I}_{\mathrm{C\text{-}1}}} = \frac{h_1 + h_2 + h_3 + h_4 + h_5 + h_6}{h_1 + h_2 + h_3 + h_4 + h_5} = \frac{1}{1 - h_6}$$

$$\therefore\ \overline{I}_{\mathrm{C\text{-}2}} = \frac{\overline{I}_{\mathrm{C\text{-}1}}}{1 - h_6} \qquad (8)$$

（c）$\overline{I}_{\mathrm{C\text{-}3}}$: average number of incidents per company among those respondents in the area U_1. According to assumption（c），

$$\overline{I}_{\mathrm{C\text{-}3}} = \frac{u_1 \times u \times \overline{I}_{\mathrm{C\text{-}2}}}{h} \qquad (9)$$

where u_1 is the percentage in Table 7，and u，h in Table 4（Appendix）.

（d）$\overline{I}_{\mathrm{C\text{-}4}}$: average number of incidents per company among those respondents in the area U. According to assumption（f），

$$\overline{I}_{\mathrm{C\text{-}4}} = (1 + \frac{u_1 \times u_3}{u_1 + u_2}) \times \overline{I}_{\mathrm{C\text{-}3}} \qquad (10)$$

[*] We regard incident，attack or misuse as one term in our paper.

where u_1, u_2, and u_3 are the percentages in Table 7.

(e) $\bar{I}_{C\text{-}5}$: average number of incidents per company among all respondents in the survey, say, those in the area R. According to assumption (c),

$$\bar{I}_{C\text{-}5} = \frac{\bar{I}_{C\text{-}4}}{u} \tag{11}$$

Obviously, $\bar{I}_{C\text{-}5}$ is the value of $\bar{I}_C$ in Eq. (6). According to Eqs. (6) – (11),

$$\bar{I}_C = \frac{u_1(u_1 + u_2 + u_1u_3)}{h(1 - h_6)(u_1 + u_2)} \sum_{i=1}^{5} \frac{\min I_i + \max I_i}{2} \times h_i \tag{12}$$

6. Average losses per incident ($\bar{L}_1$)

We can start with the following formula in order to calculate $\bar{L}_1$ using weighed average method because different incident has different probability, and different amount of losses resulting from each incident.

$$\bar{L}_1 = \sum_{k=1}^{12} p_k \times \bar{L}_{1\text{-}k} \tag{13}$$

where p_k is probability that one incident belongs to type k of incident, and $\bar{L}_1(k)$ is average loss resulting from one type k incident.

7. Probability that an incident belongs to type k of incident (p_k).

First, we consider the average number of respondents who detected type k incident (R_k). Similar to $\bar{I}_C$, R_k differs in different discussion area(Fig. 2).

(a) $\overline{R\text{-}1}_k$: R_k among those respondents in the area T_k.

$$\overline{R\text{-}1}_k = t_k \times T \tag{14}$$

where T is the number of respondents who answer the question "types of attack or misuse detected in the last 12 months?" (Table 4) and t_k is its ratio to those who can detect type k incident in a comparison of all respondents(see Appendix, Table 9).

(b) $\overline{R\text{-}2}_k$: R_k among those who know that they suffered from unauthorized use of computer systems within the last 12 months, say, those in the area U_1. Obviously, $\overline{R\text{-}2}_k$ is equal to $\overline{R\text{-}1}_k$ because those who can know the number of incidents must be those who detected the incidents and vice versa.

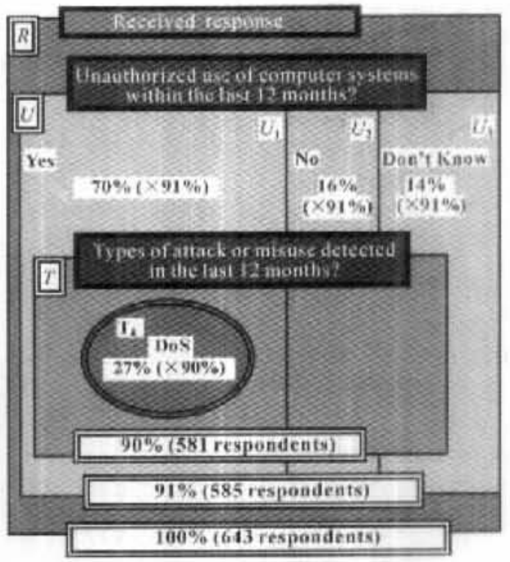

Fig. 2 Denial of service attack in 2000

Source: 2000 CSI/FBI computer crime and secunty survey

(c) $\overline{R\text{-}3}_k$: R_k among those respondents in the area U. According to assumption (f) and the above discussion,

$$\begin{aligned}\overline{R\text{-}3}_k &= \left(1 + \frac{u_1u_3}{u_1 + u_2}\right)\overline{R\text{-}1}_k \\ &= \left(1 + \frac{u_1u_3}{u_1 + u_2}\right) \times t_k \times T\end{aligned} \tag{15}$$

(d) $\bar{C}_k$ average number of companies that actually suffered from type k incident among all respondents to the CSI/FBI survey, say, among those in area R. According to assumption (f),

$$\frac{\bar{C}_k}{100\%} = \frac{\overline{R\text{-}3}_k}{u} \quad \therefore \quad \bar{C}_k = \frac{\overline{R\text{-}3}_k}{u} \tag{16}$$

(e) p'_k: The probability that each respondent suffered from type k incident is

$$p'_k = \frac{\dfrac{\bar{C}_k}{R}}{\displaystyle\sum_{j=1}^{12} \frac{\bar{C}_j}{R}} = \frac{\bar{C}_k}{\displaystyle\sum_{j=1}^{12} \bar{C}_j} = \frac{t_k}{\displaystyle\sum_{j=1}^{12} t} \tag{17}$$

where R is the number of received response (Table 4).

Limited to available material, we can only assume equal probability of each kind of attack---assumption (g). Thus,

$$p_k = p'_k \tag{18}$$

We can infer from Eqs.(14) – (18) that

$$p_k = \frac{t_k}{\sum_{j=1}^{12} t_j} \qquad (19)$$

8. Average losses resulting from one type k incident ($\bar{L}_{\text{I-}k}$)

The value can be calculated as follows:

$$\bar{L}_{\text{I}-k} = \frac{L_{\text{R}-k}}{I_{\text{R}-k}} \qquad (20)$$

where $\bar{L}_{\text{R-}k}$ is the average losses per respondent resulting from type k incident among those with quantifiable financial loss (Table 9), and $\bar{I}_{\text{R-}k}$ is average number of times per respondent suffered from type k incident among those with quantifiable financial loss. According to assumption (g),

$$I_{\text{R}-k} = \frac{Q \times \bar{I}_{\text{C}-1}}{\sum_{j=1}^{12} Q_j} \qquad (21)$$

where Q is the number of all respondents who can quantify their financial losses (Table 4), Q_j is the number of respondents who can quantify their financial loss resulting from type j incident (Table 9). So, we can infer from Eqs. (7), (20) and (21) that

$$\therefore \quad L_{\text{I}-k} = \frac{L_{\text{R}-k} \times \sum_{j=1}^{12} Q_j}{Q \times \sum_{i=1}^{5} \frac{\min I_i + \max I_i}{2} \times h_i} \qquad (22)$$

According to assumption (c), (d), (e), and (f), we can infer the value of $L_{\text{I-}k}$ is the same among all respondents who know the number of incidents suffered.

Data analysis process

Based on the above methodology and terms, we can present our calculating model for estimation of FLR as follows.

Step 1: calculate $\bar{G}_{\text{C}}$ based on Eq.(3)
Step 2: calculate $\bar{E}_{\text{O}}$ based on Eq.(4)
Step 3: calculate $\bar{I}_{\text{C}}$ based on Eq.(12)
Step 4: calculate p_k based on Eq.(19)
Step 5: calculate $\bar{L}_{\text{I-}k}$ based on Eq.(22)
Step 6: calculate $\bar{L}_{\text{I}}$ based on Eq.(13)
Step 7: calculate L_{C} based on Eq.(6)
Step 8: calculate FLR_{C} based on Eq.(1)

Then we regard FLR_{C} as estimation of FLR.

RESULTS OF DATA ANALYSIS

1. Average gross income per company

$\bar{G}_{\text{C-1999}} = \$524.83$ Million

$G_{\text{C-2000}} = \$628.58$ Million

2. Average number of employees per organization

$\bar{E}_{\text{O-1999}} = 5449$

$E_{\text{O-2000}} = 5386$

3. Average number of incidents per company

$\bar{I}_{\text{C-1997}} = 5.7 \quad \bar{I}_{\text{C-1999}} = 11.7$

$\bar{I}_{\text{C-1999}} = 13.0 \quad \bar{I}_{\text{C-2000}} = 5.4$

4. Probability that an incident belongs to type k (see p_k in Table 1)

5. Average losses resulting from one type k incident (see $\bar{L}_{\text{I-}k}$ in Table 1)

6. Average losses per incident

$\bar{L}_{\text{I-1997}} = \$88\ 416 \quad \bar{L}_{\text{I-1998}} = \$171\ 771$

$L_{\text{I-1999}} = \$94\ 129 \quad L_{\text{I-2000}} = \$96\ 258$

7. Average losses per company

$L_{\text{C-1997}} = \$503\ 971 \quad L_{\text{C-1998}} = \$2\ 009\ 720$

$L_{\text{C-1999}} = \$1\ 223\ 667 \quad L_{\text{C-2000}} = \$1\ 482\ 373$

8. Financial losses ratio per company

$FLR_{\text{C-1999}} = 0.233\%$

$FLR_{\text{C-2000}} = 0.236\%$

DISCUSSION AND CONCLUSION

From Section 3, we can see that the average number of incidents per company is increasing and that this trend continues. In addition, we must note that average loss resulting from each incident and average amount of loss is very large.

What we must point out is that estimation of the financial loss ratio varied very little in 1999 and 2000 although the main data of CSI/FBI survey varied much more. And we can see that the estimation value is believable from following example analysis. This provides evidences supporting package E-insurance because we can estimate the possible financial losses by analyzing the gross income and FLR last year.

First, we analyze some examples cited from CSI/FBI 1999 computer crime and security survey. We can approximately evaluate the loss ratio from viewpoint of enterprise ($\tilde{r}_e$) using the following formula:

$$\tilde{r}_e = \frac{L_e}{G_e} \tag{23}$$

where L_e is the financial loss of certain enterprise, G_e is the gross income of that enterprise(Table 2).

Table 2 shows the results showing that average $\tilde{r}_E$ among all enterprises is equal to 0.217%, which is close to $FLR_{C\text{-}1999}$.

Second, according to E-commerce Times of Feb. 11,2000, today' s general insurance about E-commerce security is that companies with revenues of $ 1 billion or less can expect to pay premiums of about $ 25 000 to $ 125 000 for at least $ 25 million in coverage, even as high as $ 200 million. Thus, we can approximately evaluate the loss ratio from viewpoint of insurance industry ($\tilde{r}_I$) using Eq. (24) and Table 3 shows the results.

$$\tilde{r}_I = \frac{premiums}{coverage} \tag{24}$$

From Table 2 and Table 3, we can see that FLR_{1999} equal to 0.233% is reasonable, and can be viewed as FLR estimation for both the insured and insurer. Therefore, this model is feasible and practical.

MODEL' S LIMITATIONS AND FUTURE WORK

From Section 2, we can easily find the weak points of our model are that it is based on a series of assumptions, which may not thoroughly confirmed facts, and it relies on indirect, not original data. This will reduce the applicability of the model.

For precise estimation of FLR, we must go deep into the relation of incident, financial loss, and technologies used. Furthermore, how to certify the loss of E-commerce must be gone further into.

Table 1 P_k and $\bar{L}_{I\text{-}k}$

Type (k)	P_k				$\bar{L}_{I\text{-}k}$($)			
	1997	1998	1999	2000	1997	1998	1999	2000
1	–	0.06	0.07	0.07	–	27 766	47 883	30 468
2	0.16	0.17	0.15	0.14	16 946	11 539	35 912	1 957
3	0.01	0.003	0.004	0.002	–	17 669	8 256	1 397 610
4	0.08	0.04	0.04	0.03	288 530	194 364	11 145	44 164
5	0.11	0.11	0.12	0.17	80 717	1 012 929	59 028	279 522
6	0.23	0.21	0.20	0.21	33 892	19 833	18 575	17 330
7	0.03	0.04	0.03	0.03	426 775	139 913	606 794	172 745
8	0.19	0.20	0.21	0.19	8 027	20 194	38 802	46 121
9	0.06	0.06	0.07	0.06	58 865	31 012	42 517	48 078
10	0.03	0.02	0.03	0.02	20 068	20 194	31 784	9 224
11	0.04	0.04	0.03	0.04	73 136	31 012	67 696	149 824
12	0.06	0.05	0.05	0.05	425 883	604 729	762 827	317 537

Table 2 Several loss ratio examples from viewpoint of enterprise in 1999

Enterprise	Number of employees	Gross income (G_e: $ million)	Financial Loss (L_e: $ million)	Loss ratio ($\tilde{r}_E$: %)
A financial institution	5 000	481.6*	1.0	0.21
Another financial institution	10 000	963.2*	3.0	0.31
A high-tech company		500.0	0.5	0.10
A petroleum and chemical company	1 000	96.3*	1.1	1.14
A manufacturer		1 000.0	1.0	0.10
All enterprises		3 041.1	6.6	0.217

* Note: these data are equal to average gross income per employee ($\bar{G}_E$) multiplied by number of employees (According to the result of step1 and step2, and Eq.(5), we can infer that $\bar{G}_{E\text{-}1999}$ = $ 96 316).

Table 3 Evaluation of loss ratio from viewpoint of insurance industry

	Premium	Coverage	Evaluation of loss ratio ($\tilde{r}_I$: %)
1	$ 25 000	$ 25 000 000	0.1000
2	$ 25 000	$ 200 000 000	0.0125
3	$ 125 000	$ 25 000 000	0.5000
4	$ 125 000	$ 200 000 000	0.0625

Appendix

Table 4 Respondents in CSI/FBI survey

		1997	1998	1999	2000
Number of all respondents(R)		563	520	521	643
Who detected attack or misuse	Num (T)	492	458	405	581
	%(t)	87%	88%[1]	78%	90%
Who acknowledged financial losses	Num	422	376	265	477
	%	75%	72%[2]	51%	74%
Who can quantify financial losses	Num(Q)	332[3]	218[4]	163	273
	%	59%	42%	31%	42%
Who acknowledged unauthorized use of computer systems	Num(U)	391	515	512	585
	%(u)	69%	99%	98%	91%
Who answered "how many incidents?"	Num(H)	271	234	327	392
	%(h)	48%	45%	63%	61%

[1] The percentage in CSI/FBI Survey is 89%, adjusted; [2] The percentage in CSI/FBI Survey is 73%, adjusted; [3] 563 * 59%; [4] 520 * 42%

Table 5 Respondents by gross income

Class (i)	Min (min G_i) ($ million)	Max (max G_i) ($ million)	Percentage(a_i: %)	
			1999	2000
1	5[1]	10	17	17
2	11	99	17	15
3	100	500	10	14
4	501	1000	40	11
5	1000	1300[2]	16	43

[1] Scope of class is "under $ 10 million" [2] Scope of class 5 is "over $ 1 billion"

Table 6 Respondents by number of employees

Class (i)	Min (min E_i)	Max (max E_i)	Percentage(b_i: %)	
			1999	2000
1	1	99	12	12
2	100	499	12	11
3	500	999	7	9
4	1 000	5 000	27	26
5	5 001	9 999	11	12
6	10 000	14 000*	31	30

* Scope of class 6 is "10 000 or more" in CSI/FBI survey

Table 7 Percentage of respondents being aware of attack(%)*

Year	Yes(u_1)	No(u_2)	Don't know(u_3)
1996	42	37	21
1997	50	33	19
1998	64	18	18
1999	62	17	21
2000	70	16	12

* The percentage is the ratio of respondents among those who answered "Unauthorized use of computer system within the last 12 months?"

Table 8 Percentage of respondents by incidents reported (%)*

Year	1 ~ 5(h_1)	6 ~ 10(h_2)	11 ~ 30(h_3)	31 ~ 60(h_4)	*Over* 60(h_5)	*Don' t know*(h_6)
2000	33.0	23.0	5.0	2.0	6.0	31.0
1999	34.0	22.0	7.0	2.0	5.0	30.0
1998	61.0	31.0	6.0	1.0	2.0	—
1997	47.6	22.5	2.9**	—	—	27.0
1996	45.8	20.6	12.2**	—	—	21.4

* The percentage is the ratio of respondents among those who answered the question "how many incidents?"

** In '1996 and '1997, CSI/FBI asked only 11 or more

Table 9 Percentage of respondents and average losses by types of attack or misuse

Type (k)	Attack or misuse	Percentage of respondents who have detected attack or misuse (%: t_k)				Respondents who can quantify financial losses(Q_i)				Average losses per respondent ($\bar{L}_{R\text{-}k}$) (× $ 1000)			
		1997	1998	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000
1	Denial of service	–	24	31	27	–	36	28	46	–	77	116	109
2	Laptop theft	58	64	69	60	165	162	150	174	38	32	87	7
3	Active wiretap	3	1	2	1	–	5	1	1	–	49	20	5000
4	Telecom fraud	27	16	17	11	35	32	29	19	647	539	27	158
5	Unauthorized access by insiders	40	44	55	71	22	18	25	20	181	2809	143	1000
6	Virus	82	83	90	85	165	143	116	162	76	55	45	62
7	Financial fraud	12	14	14	11	26	29	27	34	957	388	1470	618
8	Insider abuse of net access	68	77	97	79	55	67	81	91	18	56	94	165
9	System penetration	20	23	30	25	22	19	28	29	132	86	103	172
10	Telecom eavesdropping	11	9	14	7	8	10	10	15	45	56	77	33
11	Sabotage	14	14	13	17	14	25	27	28	164	86	164	536
12	Theft of proprietary into	20	18	25	20	21	20	23	22	955	1677	1848	1136

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