



Survey results

Software use in ICAs

September 2006

Summary

- 45 responses (28 life, 12 non-life) from senior actuaries (67% with more than 10 years experience in their current field, 69% leading a team or in overall charge of ICA work)
- representing 100 ICAs
- spreadsheets and actuarial models are the most commonly used software
- 73% overall use stochastic models in their ICAs (86% in non-life)
- only 12% believe they have good systems and controls round their spreadsheets
- software used in non-life ICAs is generally not subject to external audit (10%)

I Introduction

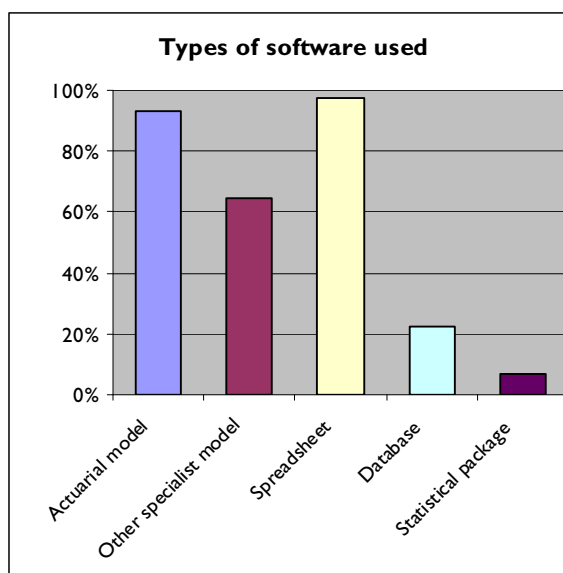
In June and July 2006 I conducted an online survey on software use in ICAs. The respondents were asked to participate through advertisements in The Actuary magazine, articles in my newsletter, which is sent to nearly 500 people each month (by no means of whom work in the insurance industry), or by telephone calls. Many of those to whom telephone calls were made were Actuarial Function Holders or With Profits Actuaries (which may explain the preponderance of respondents from life insurance companies). As a result, 52 people participated in the survey, 45 of whom gave responses that have been analysed (see section 3.1).

1.1 Who?

The respondents are mainly from life (69%) rather than non-life (31%) insurance, have spent at least 10 years in their current field (66%), and are in overall charge of the ICA process or lead a team involved in the ICA process (69%). Between them, they have probably been involved in over 100 ICAs in the last year. The survey results therefore give a view from the top of the process, and may reflect some lack of involvement in the day to day preparation of ICAs. However, it is especially important that those leading the process are fully aware of the systems and controls that are in place, so that they are in a position to judge how confident they can be in the results that are produced.

1.2 What?

The survey results show that the most common software used in ICAs are spreadsheets (98%) followed by actuarial models (93%). The only surprising part here is that there is an ICA in which no spreadsheet is used! Actuarial models are used by more respondents involved in life ICAs (97%) than non-life (86%). Stochastic models are used by 73% of respondents, but are more common in non-life (86%) than life (68%). They are used less (67%) when the respondent is involved in a single ICA, and more (100%) when the respondent is involved in five or more (see section 3.2).

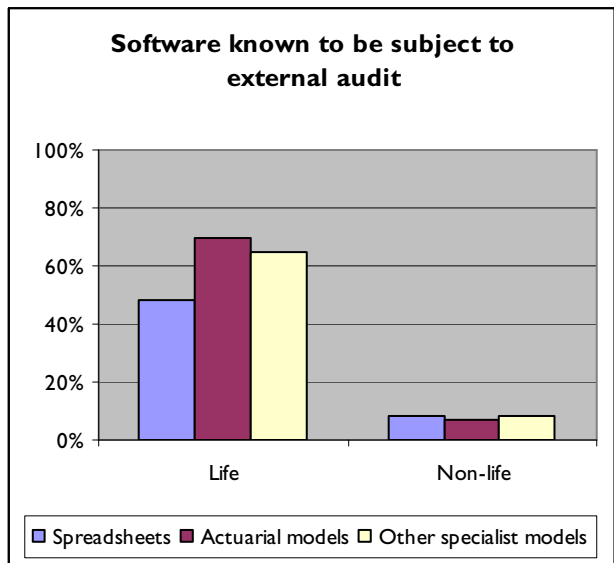
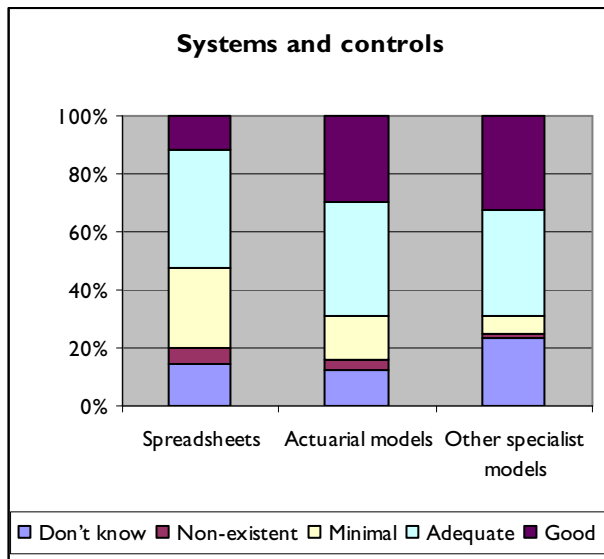


Few specialist statistical packages are used: this may indicate that spreadsheets are being used to perform statistical analysis (but there are alternative explanations). This is potentially worrying, as the statistical functionality in Excel is both limited and, in parts, wrong (see section 2.1).

1.3 How?

Systems and controls around spreadsheets are clearly worse than those around actuarial and other specialist models (12% rated as good, compared to 30%, and 48% rated as minimal or worse, compared to 31%). While the systems and controls around spreadsheets give greatest cause for concern, there is no room for complacency about those around the more formal models either. The responses to this

survey probably represent an over-estimation of the quality of systems and controls, as they are self-assessments.



Good systems and controls result in better productivity, as well as reducing risk. Error rates in spreadsheets are high (studies consistently show error rates approaching 100%) and there is no reason to suppose that they are lower in other user-developed applications, such as actuarial models. Well-designed systems and controls, based on sound software engineering principles, are the best way to reduce the error rates to acceptable levels.

Less than 10% of the software used in non-life ICAs is subject to external audit, compared to 70% of life actuarial models, and nearly 50% of life spreadsheets.

2 Overview

The survey asked questions about five general types of software, and their use in ICAs:

- Actuarial models
- Other specialist models
- Spreadsheets
- Databases
- Statistical packages

As well as finding out what software is used, the questions also tried to find out about the systems and controls surrounding its use. However, both databases and statistical packages were used by too few respondents for any conclusions to be drawn about this aspect of their use.

2.1 What software is used

As expected, spreadsheets (98% of respondents) and actuarial models (93%) were the most common types of software, followed by other specialist models (64%). I admit to some surprise that there is at least one ICA being prepared that does not use a spreadsheet somewhere in the process. Stochastic models are used by about three-quarters of respondents, but are more common in non-life insurance (86% compared to 68%). See section 3.2 for more details.

It is notable that very little specialist statistical software is used, either in the form of statistical packages (5 respondents, see section 3.7) or Excel add-ins (no respondents). If this is because statistical analysis is being performed by another specialist package, such as a stochastic modelling package, there is no particular cause for concern. However, if there is significant statistical analysis being performed using standard Excel functions, alarm bells should be ringing.

The statistical functionality in Excel is limited: there are many analyses that you just can't do, without programming from scratch yourself. In addition, the analyses that are there (mostly in the Analysis Toolpak) don't use the best available algorithms, or use non-standard definitions. Distributions are not computed with sufficient precision, missing data is handled incorrectly, and there are numerous other problems. Some of the problems are more evident in the tails of the distributions; as much actuarial work is out in the tails, particularly in ICA calculations, this makes the problems particularly unfortunate. The random number generator is not really random enough, and in one version of Excel could produce negative numbers in addition to numbers in the $[0,1]$ range as specified.

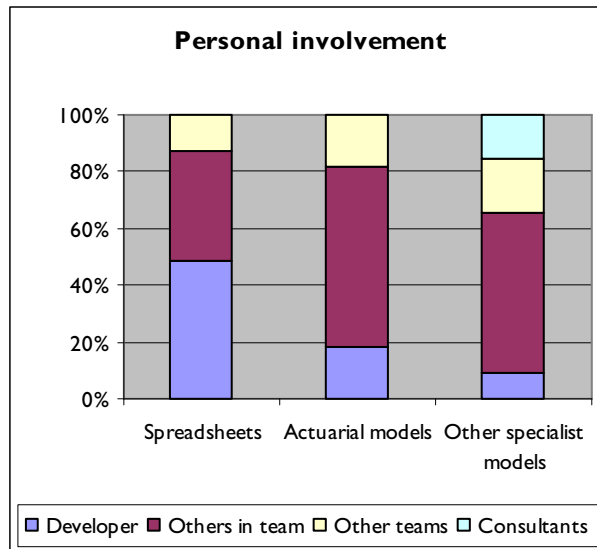
The following sources of information give more details on these issues:

- Microsoft Excel 2000 and 2003 Faults, problems, workarounds and fixes.
<http://www.daheiser.info/excel/frontpage.html>
- On the accuracy of statistical procedures in Microsoft Excel 2000 and Excel XP. BD McCullough and B Wilson, *Computational Statistics & Data Analysis*, 40, pp 713 – 721. 2002.
- Is Microsoft Excel an Adequate Statistics Package?
<http://www.practicalstats.com/Pages/excelstats.html>
- Excel statistical functions. <http://www.louisepryor.com/showTheme.do?theme=15>

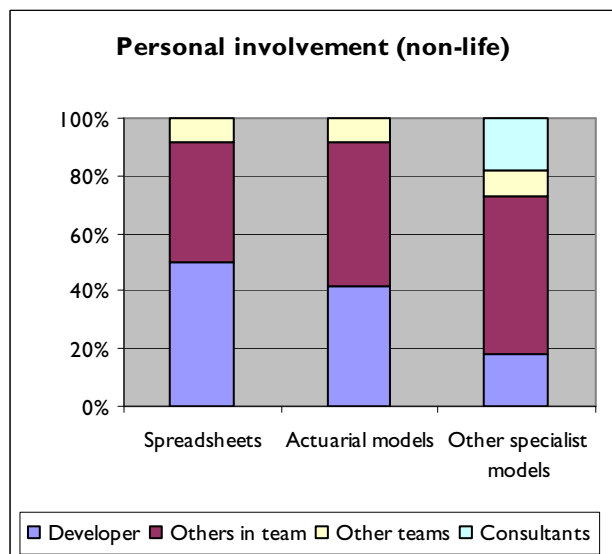
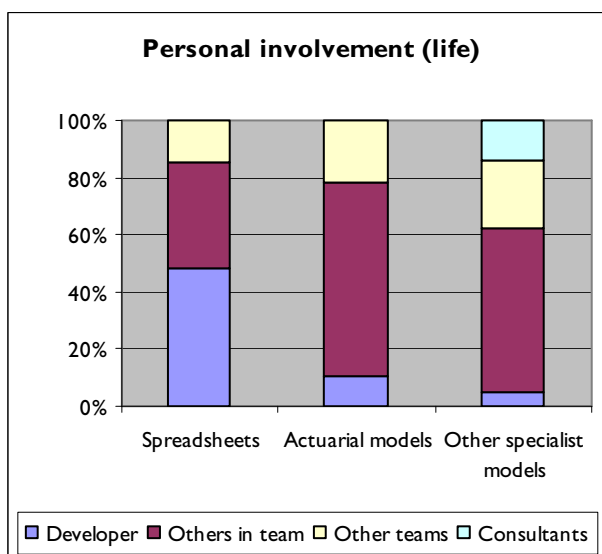
2.2 Personal involvement

Respondents were asked whether they personally were involved in the development of each type of software, or whether it was developed and run by others in their team, other teams, or consultants.

49% develop spreadsheets themselves, but actuarial models and other specialist models are typically developed by others within the team (64% and 56%).



The personal involvement in spreadsheets does not vary much between life and non-life, but the non-life respondents have a more hands-on approach to their other models than those in life. This may be because the life respondents tend to hold more senior positions (see section 3.1), or because the non-life respondents come from smaller organisations. The latter hypothesis gains some support from the observation that there is less development done in other teams in non-life ICAs for all three types of software, suggesting that there may be fewer respondents from organisations in which more than one team works on ICAs.



2.3 Systems and controls

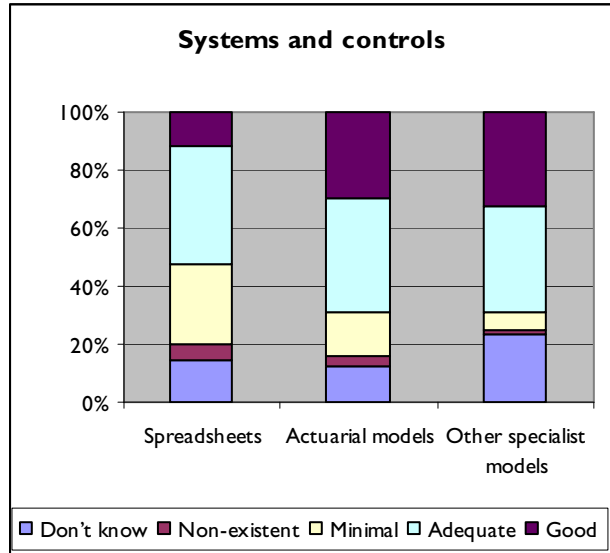
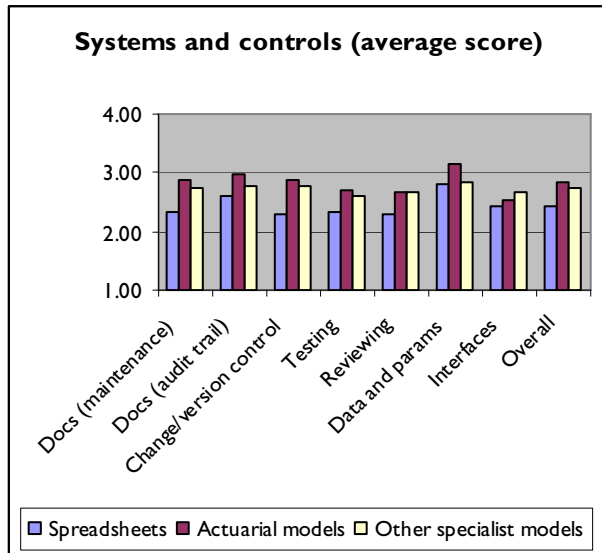
Respondents were asked to say how they thought the FSA would rate the systems and controls around their software use. The aspects that were rated were:

- Documentation (for model maintainers).
- Documentation (for audit trail)
- Change and version control
- Systematic testing
- Systematic reviewing
- Use of data and parameters

- Interface with other models or software

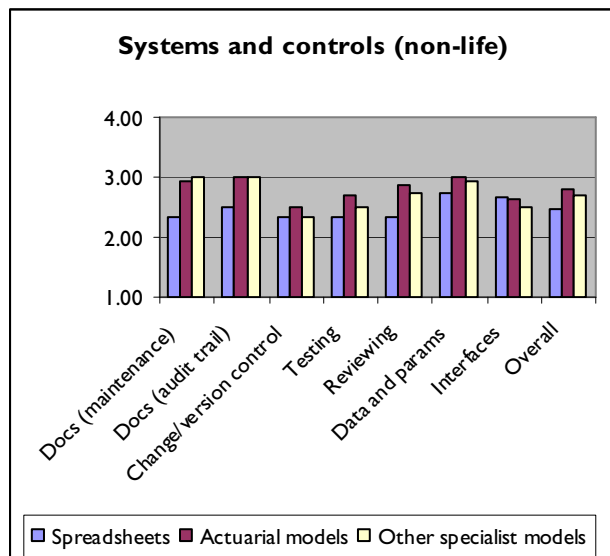
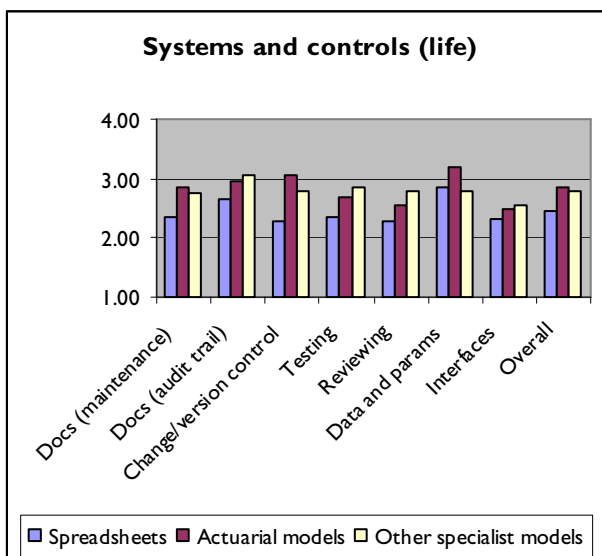
Most of these systems and controls affect the risks involved in developing and maintaining of the software. Some affect the risks involved in using it, and some are more concerned with the adequacy of the audit trail.

The systems and controls surrounding interfaces with other models or software are particularly interesting in view of the fact that several different types of software are typically used in the preparation of ICAs. Spreadsheets in particular are often used to consolidate results from other models and spreadsheets (see section 3.2).



Respondents were asked to rate their systems and controls from 1 (non-existent) to 4 (good). When calculating the average scores, “don’t know” was assigned a score of 1, the same as “non-existent”, on the assumption that if respondents don’t know about the systems and controls they are unlikely to be very effective.

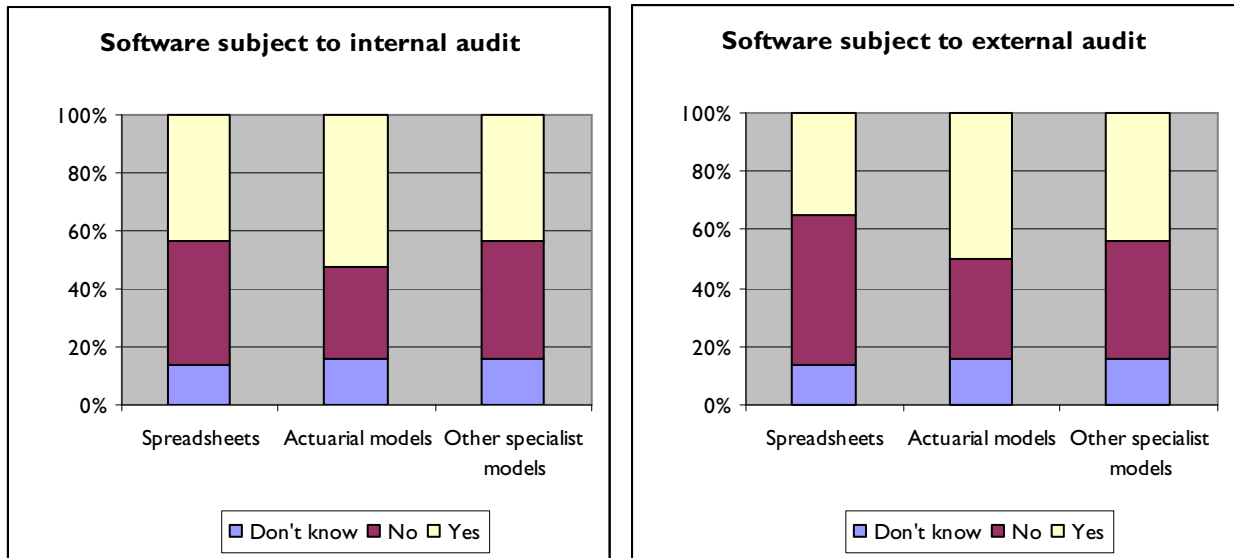
Actuarial models consistently have the highest score in each category except for interfaces, where other specialist models do better. Spreadsheets consistently come out worst. Overall, the most reliable systems and controls are in the area of data and parameters. 52% of respondents rate their systems and controls for spreadsheets as adequate or good, compared with 69% for both actuarial models and other specialist models. This means that nearly 50% of respondents think that their spreadsheets are not well controlled, and given the natural tendency of people to be over-confident, the true proportion is likely to be higher.



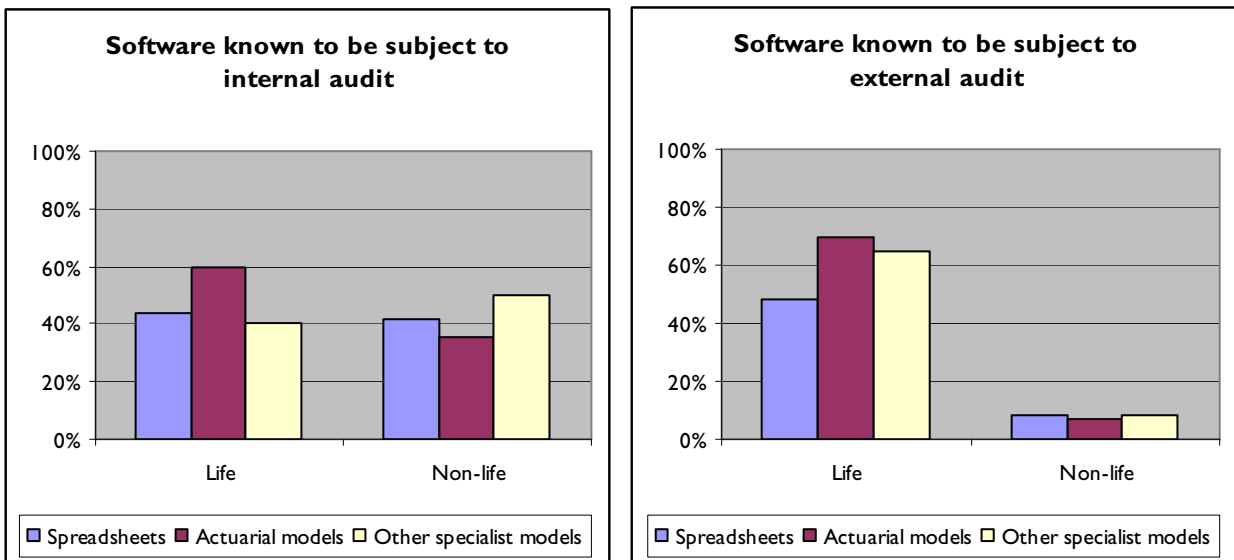
Non-life respondents appear to have less confidence in their change and version control systems for actuarial and other models than life respondents, but have more confidence in those around interfaces between spreadsheets and other software. The overall average scores are very similar for life and non-life.

2.4 Internal and external audit

ICA calculations are not themselves necessarily subject to external audit, but much of the software is also used for other reporting, and may therefore fall within the audit universe.



Actuarial models are most likely to fall within both internal and external audit universes, while spreadsheets are least likely to be subject to external audit.



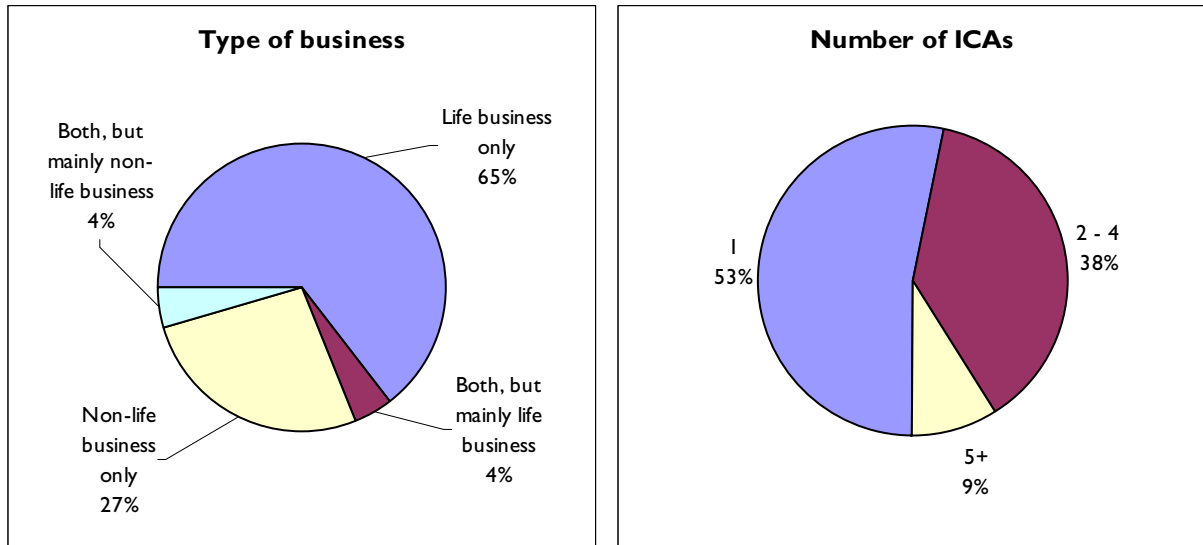
More life actuarial models (60%) are subject to internal audit than non-life actuarial models (36%). Other specialist models are more likely to subject to internal audit in non-life (50%) than life (40%). Less than 10% of non-life software is subject to external audit, compared to 48% to 70% of life software.

3 Detailed responses

The survey consisted of 9 pages or sections (see the Appendix for the details of the questions). It started off by asking about the respondent’s role in the ICA process, then went on to an overview of the software used in ICAs, followed by detailed questions on each type of software. The final page provided the opportunity for the respondents to request an analysis of the results. 9 respondents preferred to remain anonymous.

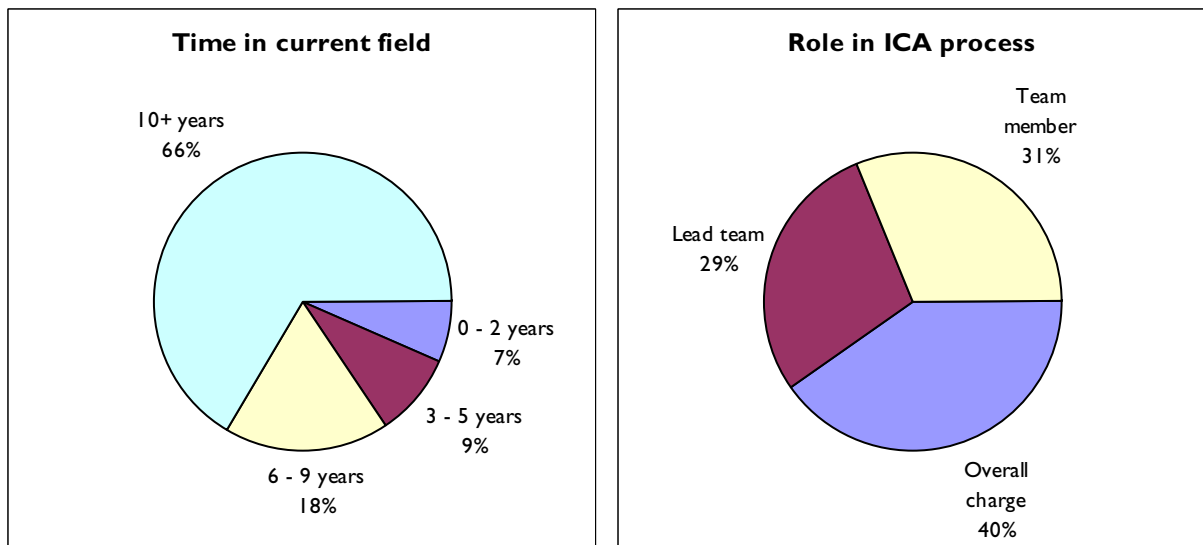
3.1 The respondents

There were 45 respondents who answered the questions about software. A further 7 started the survey, but didn’t get as far as the software questions: they have been ignored in this analysis.



The first page of the survey asked for information about respondents’ roles in the ICA process. 89% work for insurance companies (including reinsurance companies), and 11% for consultants. 87% of respondents are qualified actuaries, with a further 7% being actuarial students.

Only 4 respondents (8%) prepare ICAs for both life and non-life business. In the remainder of the analysis they are counted in with those who work in life or non-life business only, depending on where they said the majority of their work lies.



About half the respondents were involved in just one ICA in the last 12 months. Not surprisingly, a much higher proportion of consultants (60%, or 3 out of the 5 consultants in the survey) were involved in five

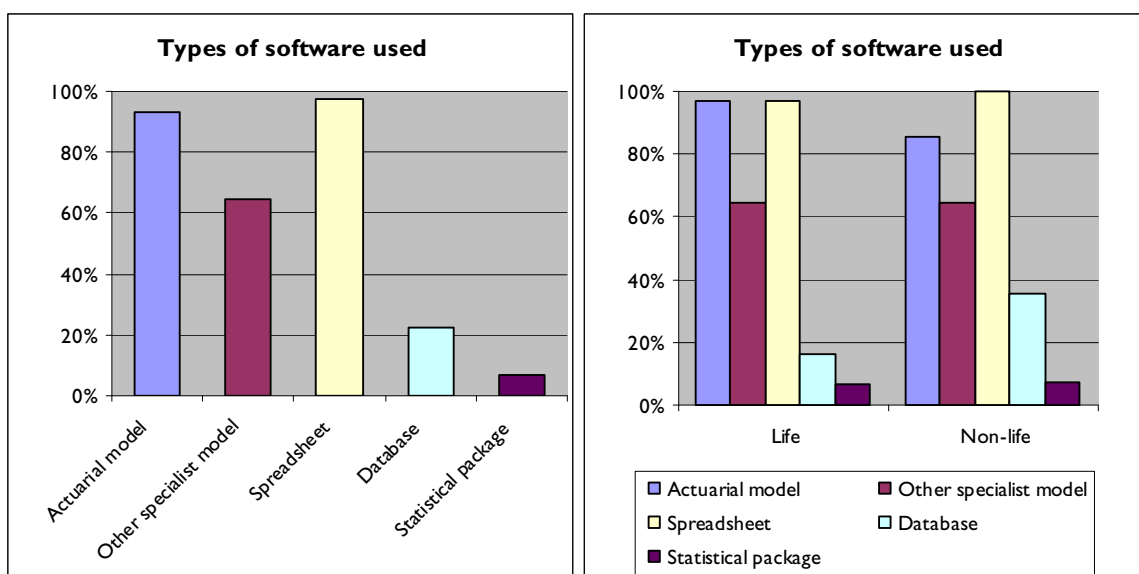
or more ICAs than those working in insurance companies (3%). Altogether, the 45 respondents have probably been involved in around 100 ICAs in the last year.

This impression of experience and seniority is reinforced by the fact that two-thirds of the respondents have been in their current field (life or non-life) for more than 10 years. The proportion is higher in life (74%) than non-life (50%).

3.2 Software

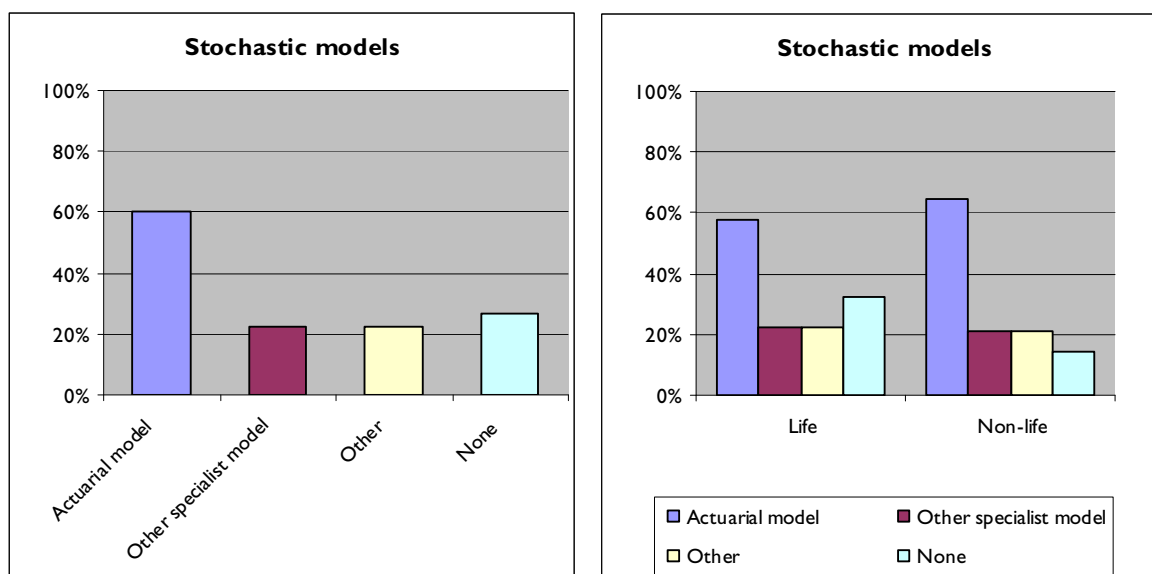
The second section of the survey asked for an overview of the software used in preparing ICAs. Some of the answers to the questions were inconsistent: for example, more people rated the importance of spreadsheets in their ICA work as useful or better than said they used spreadsheets at all. The answers to the question “Which types of software are used in the ICAs you work on?” were therefore adjusted to be consistent with the answers to the other questions on this page. If a respondent rated the importance of a type of software, said that it communicated with another type, or rated the time and effort spent on it, they were considered to use it. Moreover, the answers on this page are not always consistent with those on later pages (covering each type of software in more detail). No attempt has been made to adjust the answers analysed here to make them consistent with later answers. Significant differences are highlighted in the discussion.

Many of the questions allowed the answer “Other, please specify”. In most cases it was possible to assign those answers to one of the standard answers for that question. No explicit mention is made where this has been done, either in this section or throughout the remainder of the survey.



More people answered the questions on actuarial models later in the survey than admitted to using them here. Even so, nearly all the respondents say that they use them (93%) and spreadsheets (98%). There is slightly less use of actuarial models in non-life insurance (86%) than in life insurance (97%). Databases are used more in non-life insurance (36%) than in life (16%).

Stochastic models are used by about three-quarters of respondents, but are more common in non-life insurance (86% compared to 68%). Most of the “other” answers referred to asset and investment modelling. All respondents involved in 5 or more ICAs a year use stochastic models, compared to only 67% of those involved in a single ICA a year.



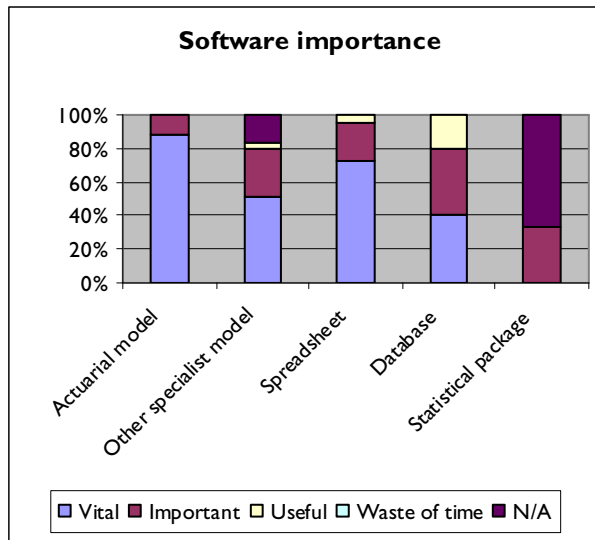
It is clear that most respondents use several different types of software in their ICAs, and that many of the types of software communicate with each other. The following table shows the percentage of respondents using each combination of software types that say that those pieces of software communicate with each other. For example, 90% of those that use both actuarial models and spreadsheets say that they communicate with each other.

| | Actuarial model | Other specialist model | Spreadsheet | Database | Statistical package |
|------------------------|-----------------|------------------------|-------------|----------|---------------------|
| Actuarial model | 31% | 50% | 90% | 67% | 100% |
| Other specialist model | | 38% | 46% | 43% | 0% |
| Spreadsheet | | | 25% | 50% | 50% |
| Database | | | | 20% | 0% |
| Statistical package | | | | | 0% |

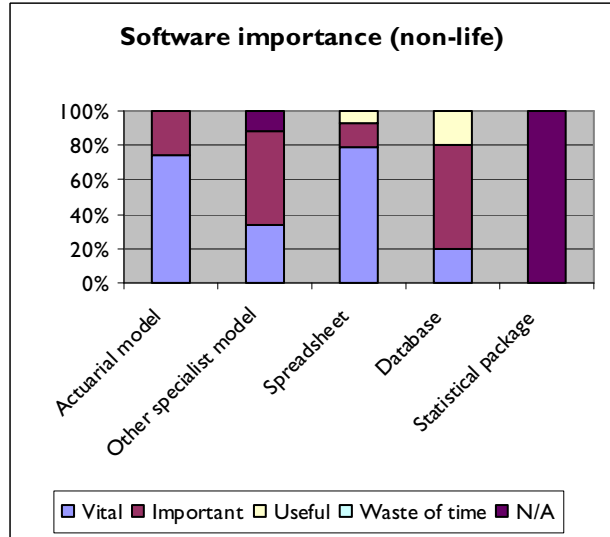
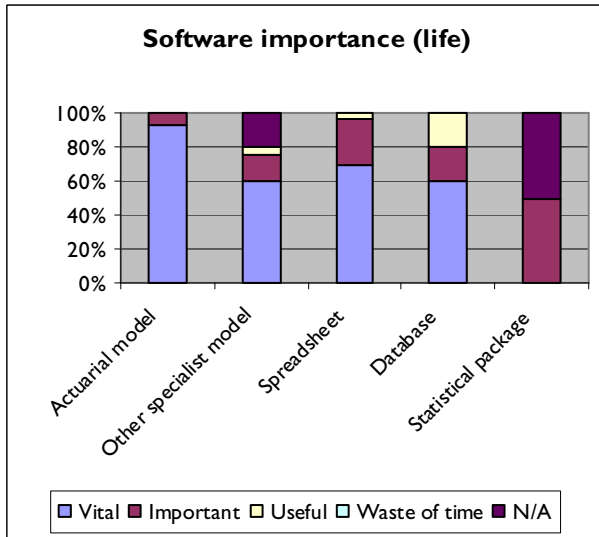
The results for statistical packages and databases may be misleading, as so few people use those software types. The question may not have been worded sufficiently clearly (see the Appendix for the precise wording) as only 25% of those using spreadsheets said that different spreadsheets communicate with each other. It is my experience that it would be most unlikely to find an ICA process in which there are no spreadsheets that communicate with other spreadsheets, whether through direct links or through copying and pasting. One respondent commented "We use spreadsheets to pull together the results from various different risk types, some of which are themselves calculated in spreadsheets, and some in other software." This is typical practice.

The answers to this question are significant because data transfer between different pieces of software is a major risk area. There are many possible points of failure: the right data may be taken from the wrong place, the wrong data may be taken from the right place, there may be a failure to update data, and there is often an inadequate audit trail, making it difficult and time consuming to check that all is as it should be.

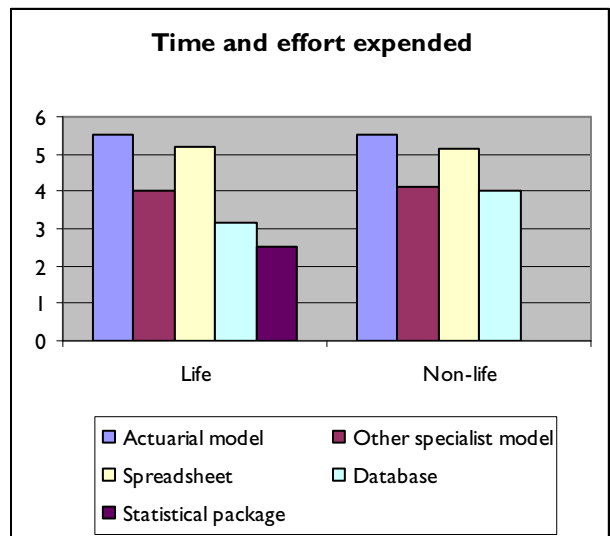
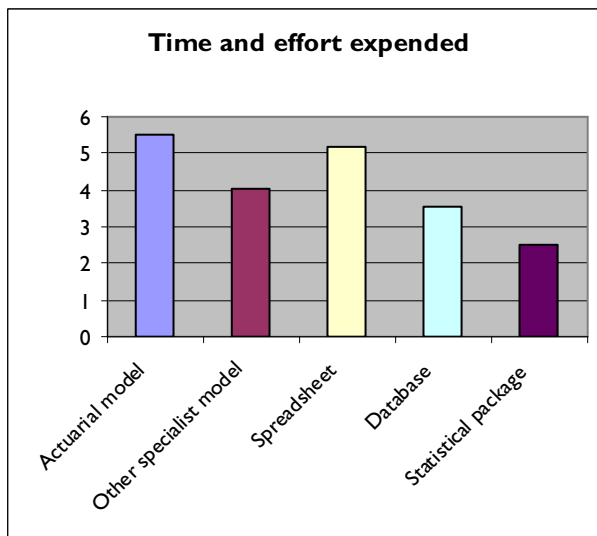
Respondents were asked to rate the importance of each type of software. Not all respondents rated every type of software that they said they used. Actuarial models are considered to be at least important by all those who use them; 95% of those who use spreadsheets think they are important or vital. Statistical packages are the only type of software that are considered vital by no respondents.



Actuarial models are considered to be more important in life than in non-life (93% vital compared to 75%), while the reverse is true of spreadsheets (70% vital compared to 79%). This may indicate that the calculations in non-life ICAs are less standardised across companies, requiring the more ad hoc programming made possible by spreadsheets.



The final question in this section asked about the time and effort expended during the ICA process on each type of software.

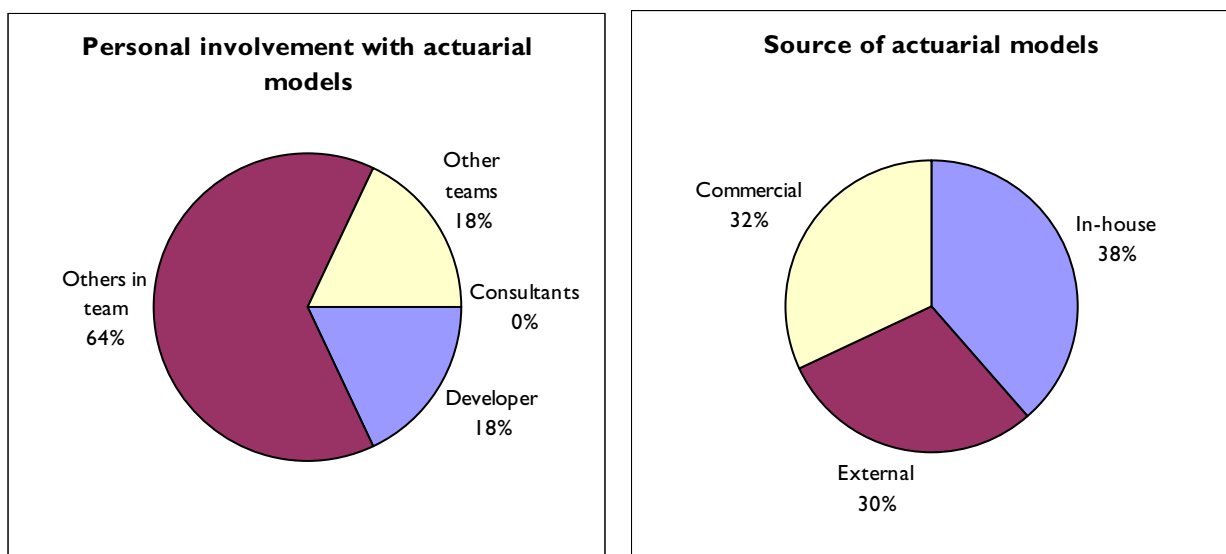


Respondents were asked to rate each type from 1 (least) to 6 (most time and effort). Actuarial models were rated most highly, with an average score of 5.5, followed closely by spreadsheets with 5.2. Overall, the ratings follow the same pattern as the ratings of importance: more effort is expended on the software that is considered most important. However, there is less difference between life and non-life. The number of people using databases and statistical packages are comparatively small, so the ratings for them are unlikely to be meaningful.

One respondent commented “The model takes up less time than spreadsheets as the model has been developed over a number of years and is now in an easy to use condition.” This type of situation may account for the fact that spreadsheets are closer to actuarial models in terms of time and effort than they are in terms of importance.

3.3 Actuarial models

44 people gave answers to the questions in the section of the survey on actuarial models. This was more than the 42 respondents (93%) who claimed to use actuarial models when they answered the question in the overview section.



The first question was about the respondent’s personal involvement with actuarial models in the ICA process. 82% say that either they or others in their team were involved in developing or maintaining the model. Nobody uses external consultants to maintain and run the model. This means that most of the respondents have a close involvement with the actuarial model.

The next question asked about the provenance of the modelling system. For the purposes of analysis, I’ve put the answers in three groups: in-house, external, and commercial. This grouping has been performed for other, similar questions on later pages of the survey, too. In-house includes

- I work for a company, and the purpose-built system was developed in-house
- I work for a consultant, and the system was developed in-house (but is not sold to clients)

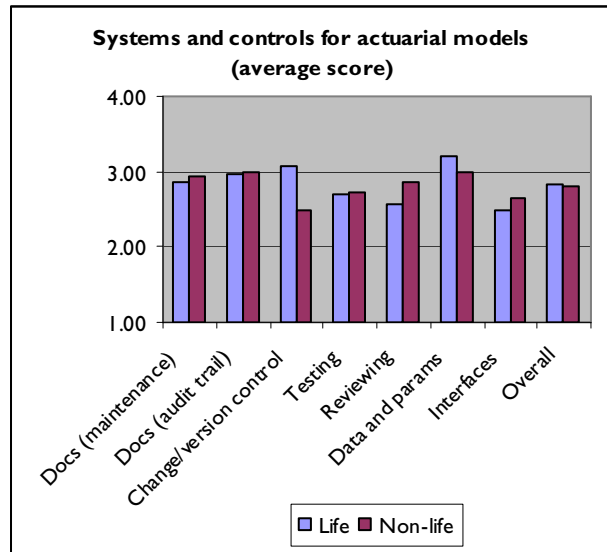
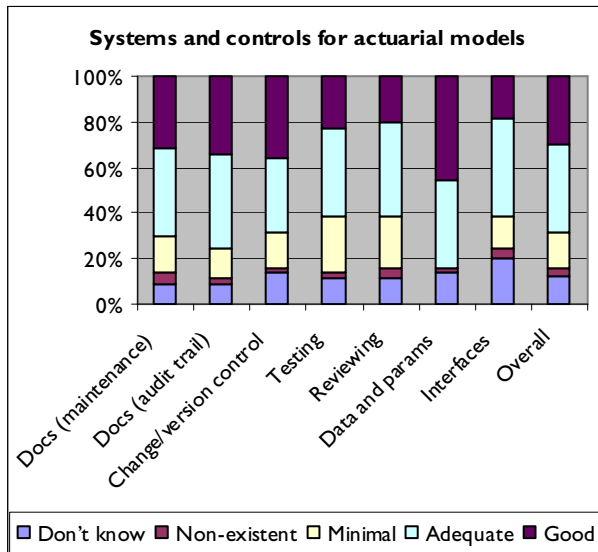
External includes:

- I work for a company, and the purpose-built system was developed for us by consultants
- I work for a consultant, and the system was developed for us by specialist software developers (but is not sold to clients)

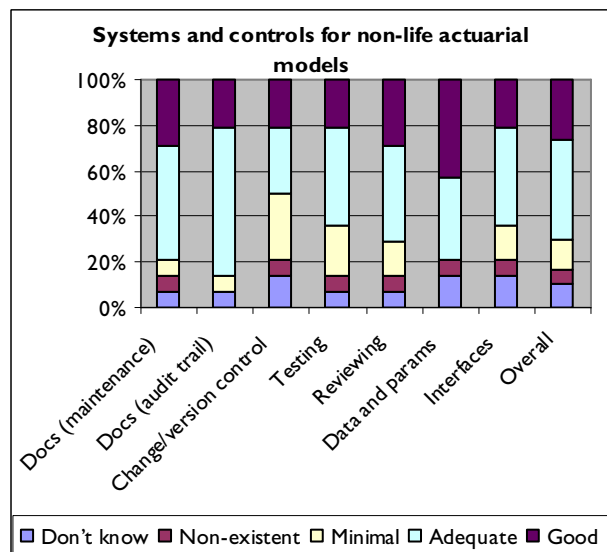
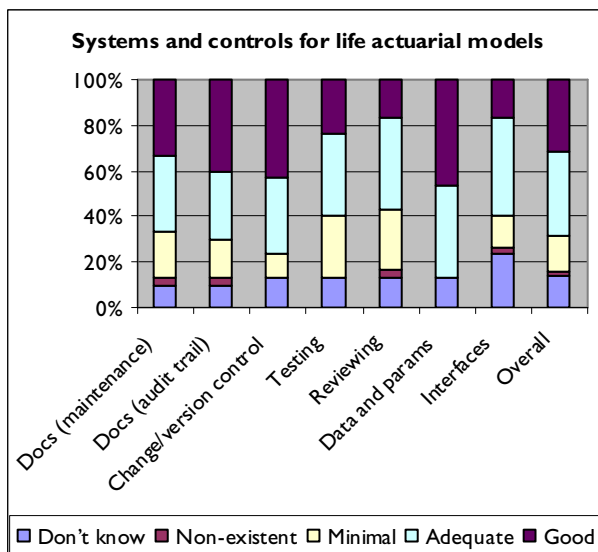
Commercial includes:

- I work for a consultant, and the system is one that we develop and sell
- It's a commercially available system

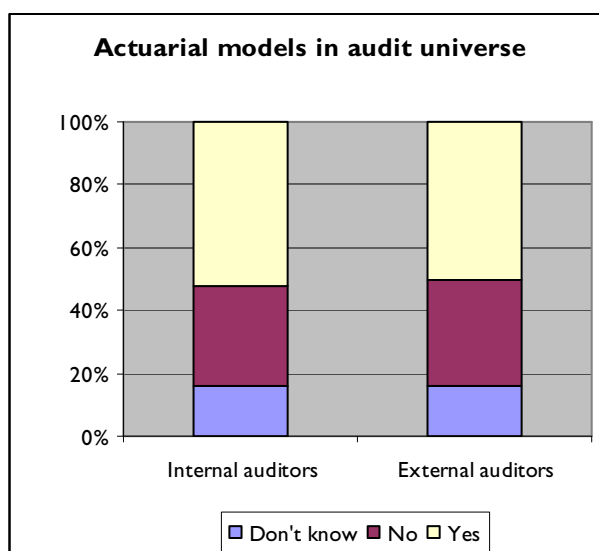
The responses were roughly evenly split between the three groups, with slightly more (39%) in-house models than the other two. The proportions are similar for both life and non-life, but no consultants use external actuarial models.



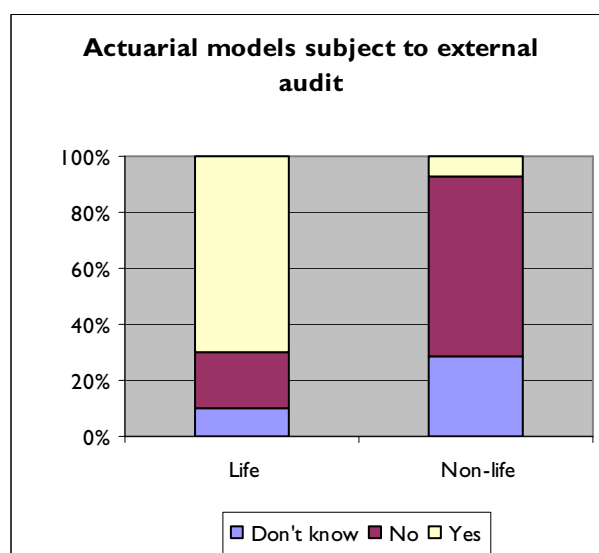
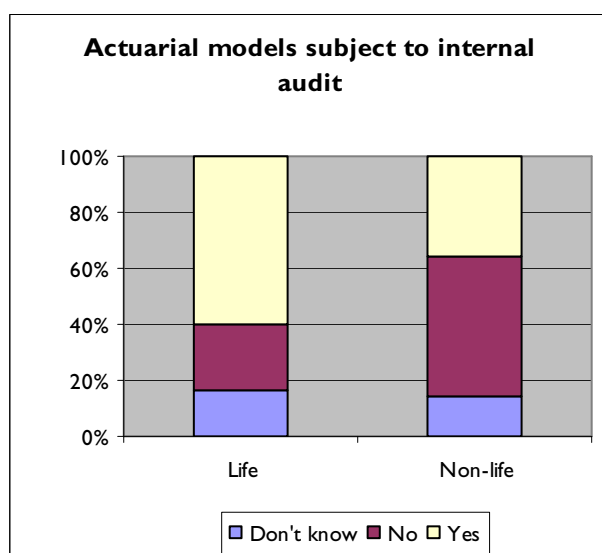
The best systems and controls are around data and parameters, with 45% of respondents rating them as good. The poorest are around systematic testing, reviewing, and interfaces with other programs, with only 20% rating them as good. “Don’t know” accounted for around 10%-15% for all systems and controls except interfaces, where it is 20%. Looking at the average scores, the biggest difference between life and non-life is in the area of change and version control, where the score for life ICAs is 3.0 compared to 2.5 for non-life.



Although the patterns are broadly similar in life and non-life, there are some interesting differences. Non-life respondents are more likely to believe that their documentation is adequate or better, especially as far as audit trails are concerned (86% compared to 70%), but more life respondents believe that theirs is good (40% compared to 21%). As shown by the average scores, there is much less confidence in processes for change and version control in non-life than in life (50% adequate or better compared to 77%).



Overall, around 50% of actuarial models are in the audit universe (both internal and external auditors), although 16% of respondents don't know whether they are or not. A much higher proportion of life models are subject to internal audit (60%) than non-life models (36%). The effect is even more marked in the case of external audit (70% compared to 7%).

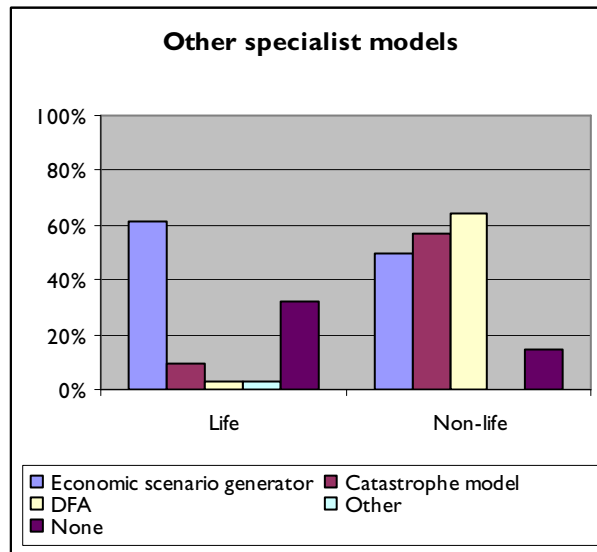


It is clear from the comments that some respondents are concerned about the level of systems and controls around their actuarial models, and that their being within the audit universe doesn't necessarily give much comfort:

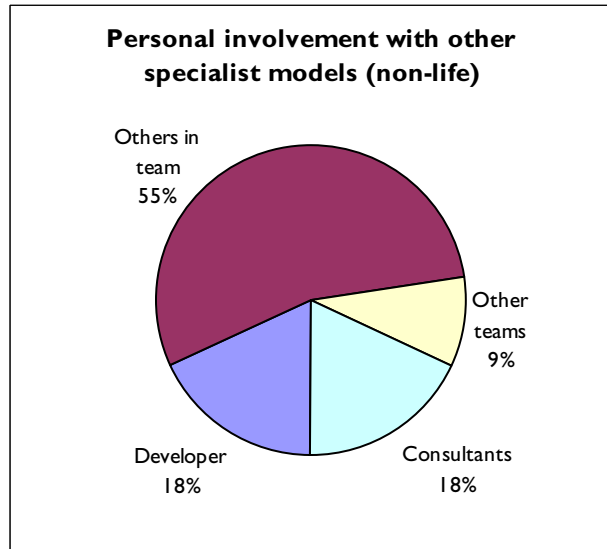
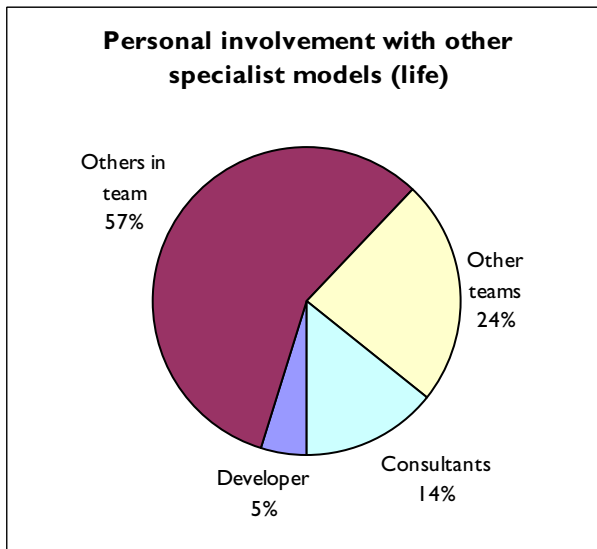
- Our models are subject to Sarbanes Oxley standards as with the rest of the financial reporting systems and processes. However, with the ICA being of little interest to the US I don't take much comfort from this.
- The model is still in a developmental stage. Documentation is not currently a priority.
- The systems and controls are developing and improving as we are using the models more
- There is more than one actuarial model used in the company. The development standards vary considerably with the newer model having had a lot more resource applied in order to ensure strong control. This is partly because the model is stochastic and therefore more complex but also because of the background of IPSB and Sarbox.

3.4 Other specialist model

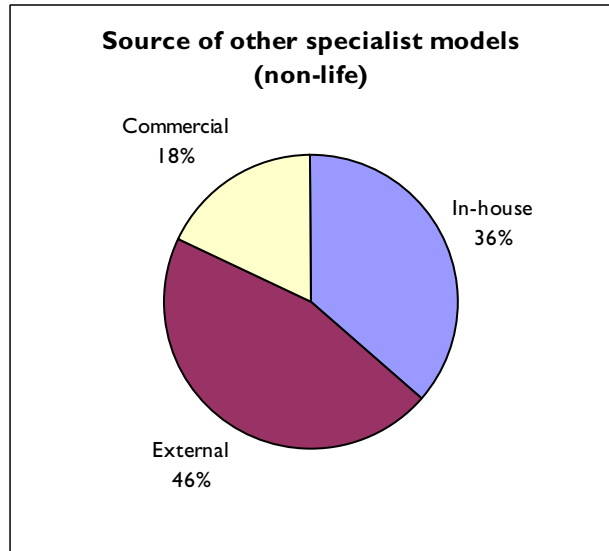
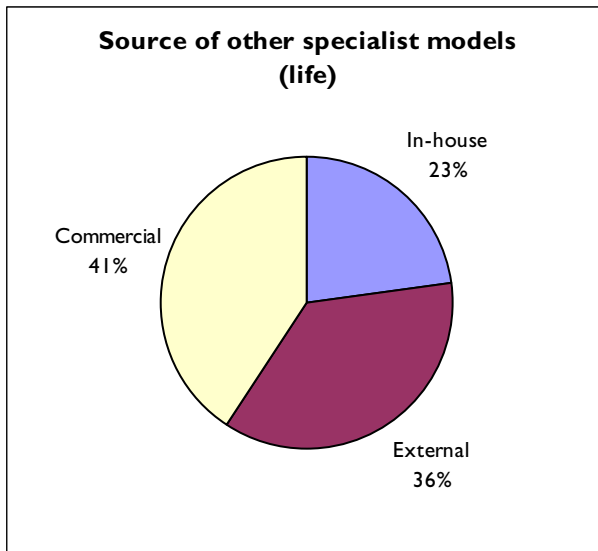
Up to 33 people answered the questions on other specialist models, more than the 29 who said that they used them when answering questions on overall software use. As expected, there is little in common between life and non-life as far as other specialist models are concerned.



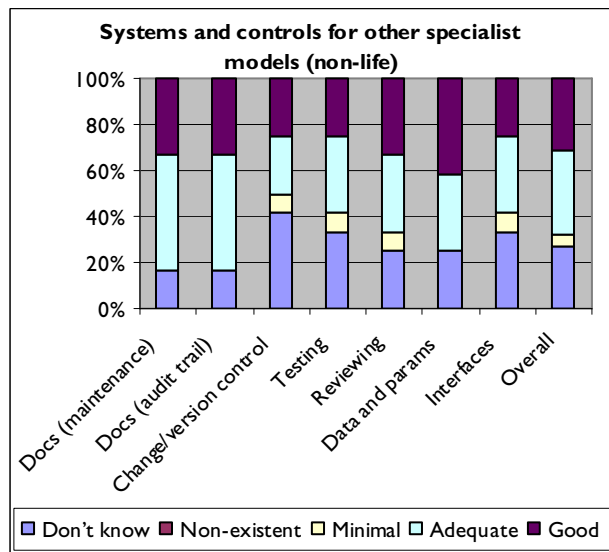
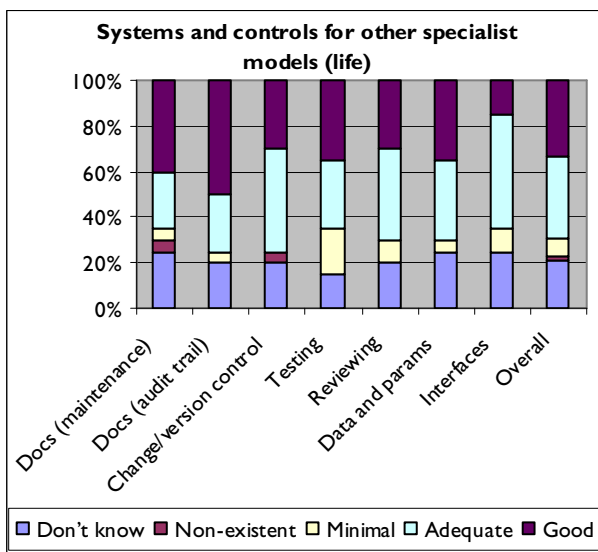
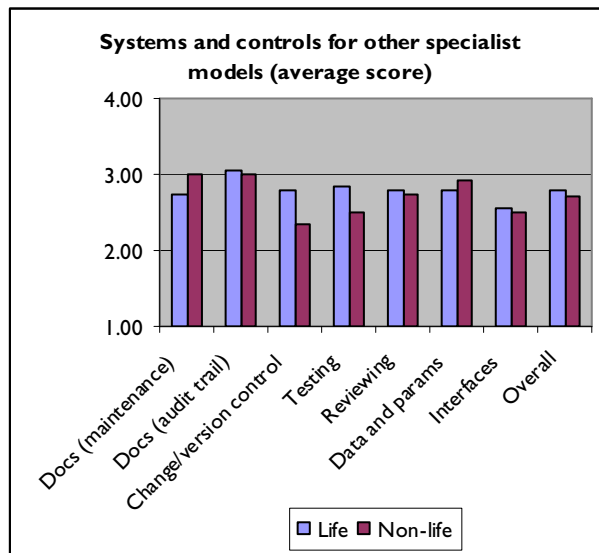
Few models other than economic scenario generators (61%) are used in life ICAs. Both catastrophe models (57%) and DFAs (64%) are used extensively in non-life ICAs, as well as economic scenario generators (50%). Overall, non-actuarial specialist models are much more common in non-life ICAs than in life ICAs (86% compared to 68%).



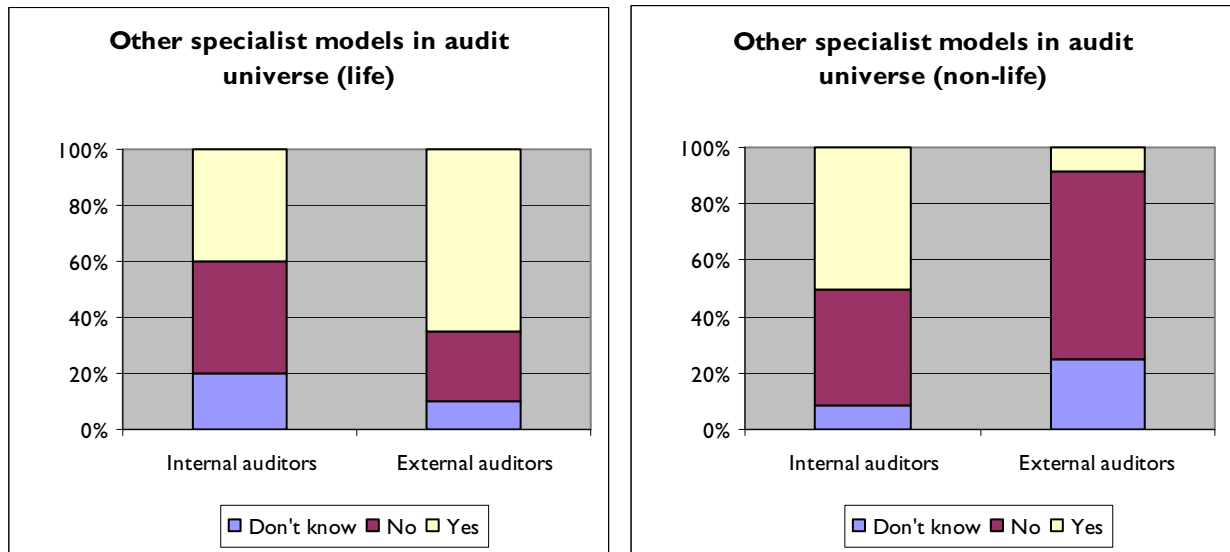
Of those who use other specialist models, the non-life respondents are more closely involved with their models than those in life. Both life and non-life actuaries make much more use of consultants for these models than they do for their actuarial models.



Commercial modelling systems are much more common in life ICAs than they are in non-life ICA, probably because most life specialist models are in fact economic scenario generators. Specialist models are more likely to be built in-house for non-life ICAs.



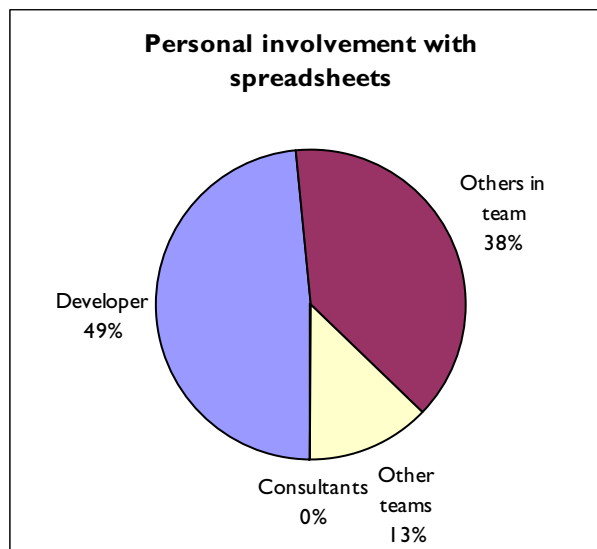
A slightly higher proportion of life respondents rated the systems and controls of their models (an average of 21% don't know for life across the categories, 27% for non-life). However, of those respondents that did rate them, the non-life respondents are more confident. This appears to be because fewer of them use the non-existent or minimal ratings, although more good ratings are used by life respondents. This is especially true in the area of documentation.



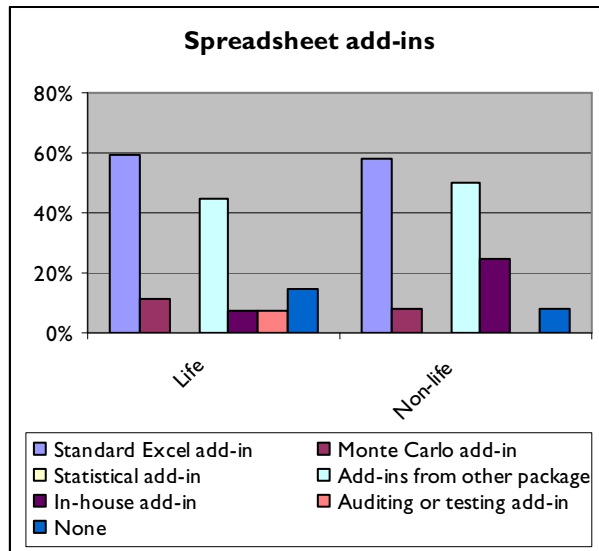
A much higher proportion of life specialist models than non-life models are in the external audit universe. Under 10% of non-life models are known to be subject to external audit, compared to over 60% of life-models. Slightly more of the non-life models are subject to internal audit, though (50% compared to 40%).

3.5 Spreadsheets

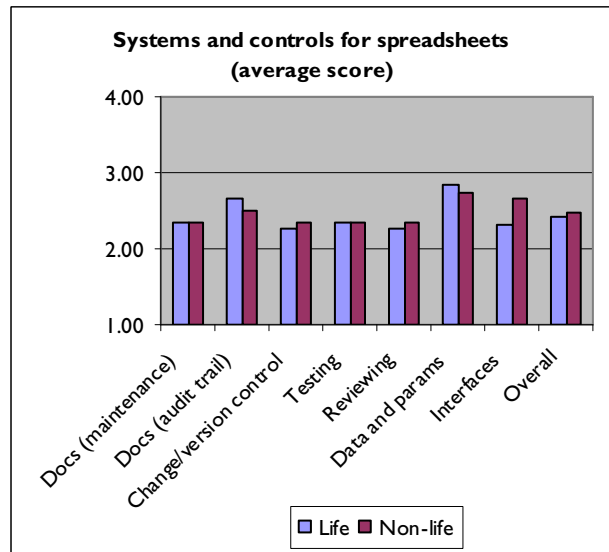
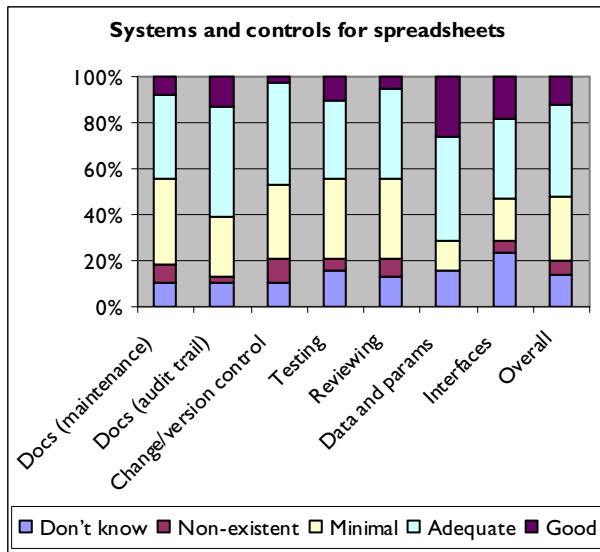
39 people answered the questions on spreadsheets, compared to the 44 who claimed to use them in the overview section of the survey. All 39 use Excel. One person uses Lotus, and one uses Sun Star Systems, both in addition to Excel.



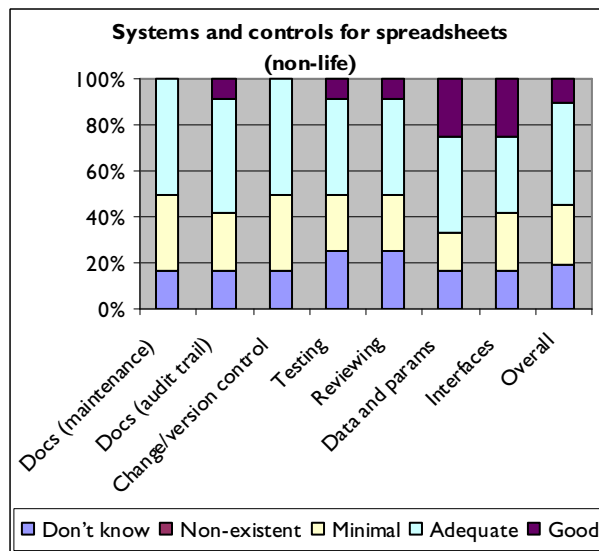
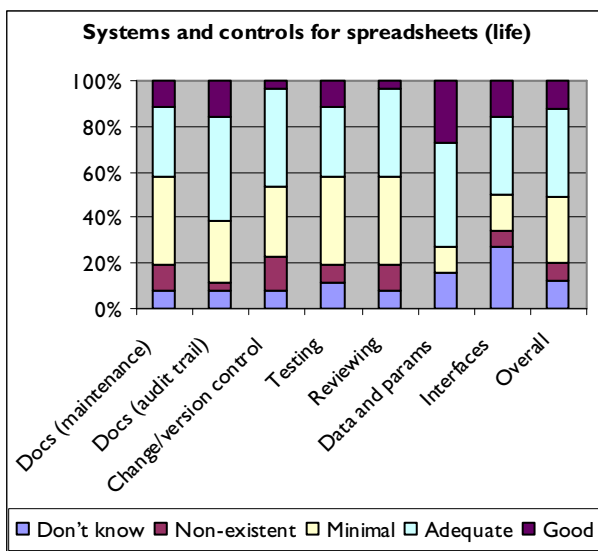
Nearly 50% of respondents develop spreadsheets themselves. Only 13% have little close involvement with the spreadsheets used in the ICA, as they are developed and run by other teams. The picture does not vary much between life and non-life ICAs, although more spreadsheets are developed and run within non-life teams (42%) than life teams (37%).



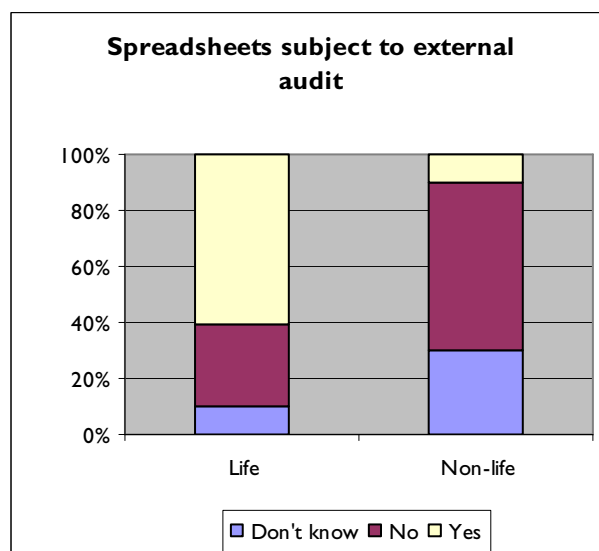
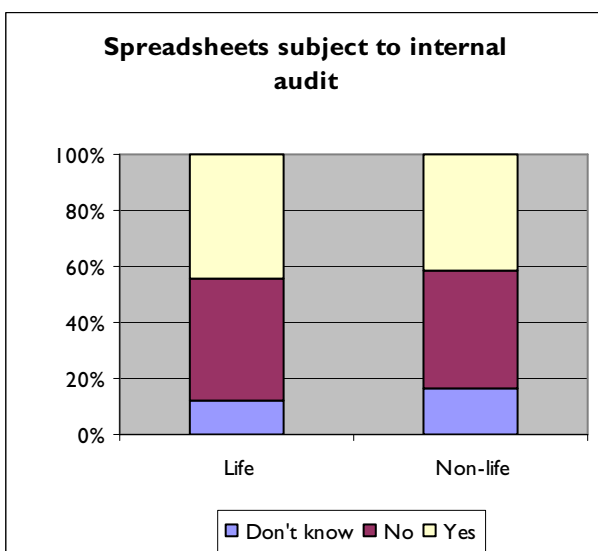
Overall, 87% of respondents say that they use at least one spreadsheet add-in. The most common are standard Excel add-ins, such as the Analysis Toolpak and Solver, which are used by 59% of respondents. Their use may be under-reported, as some people don't realise that they are add-ins rather than base functionality. The next most common add-ins are those supplied as part of another package (46%). They are often used to import data from the other package into Excel. In-house add-ins are more common in non-life ICAs (25%) than life ICAs (7%), whereas the opposite is true of Monte Carlo add-ins (11% life, 8% non-life). There were no specific comments on what the in-house add-ins are used for. One respondent, who happened to work in life, uses an auditing or testing add-in. No respondents use statistical add-ins, which is surprising given the known problems with statistical functions in Excel.



There appears to be much less confidence in the systems and controls around spreadsheets than in those around actuarial and other models. Fewer respondents rated theirs as good, and many more as minimal.



No non-life respondents rated their change and version control as good, or their maintenance documentation. No non-life respondents used the non-existent rating.

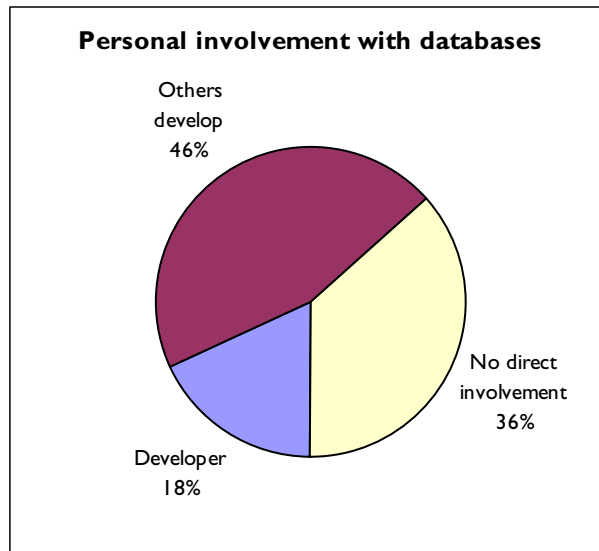


43% of spreadsheets used in ICAs are known to be subject to internal audit, and this is roughly the same for life and non-life. However, nearly 60% of life spreadsheets are subject to external audit, compared to less than 10% of non-life spreadsheets. One respondent said “As yet internal audit has not reviewed the ICA process (perhaps it should now!)”, suggesting that it is taking time for other departments to catch up with the introduction of ICAs.

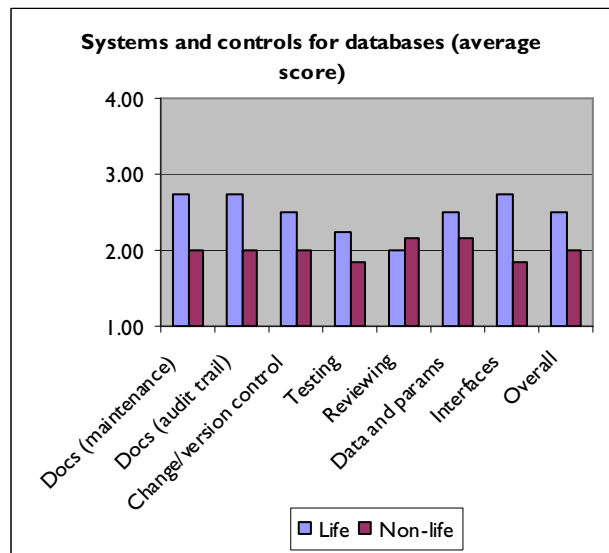
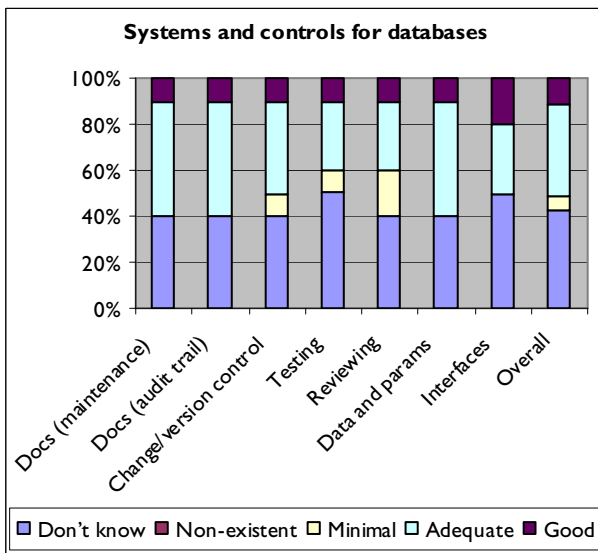
3.6 Databases

There were 11 responses to the detailed questions on databases, compared to the 10 people who said they used them in the overview section.

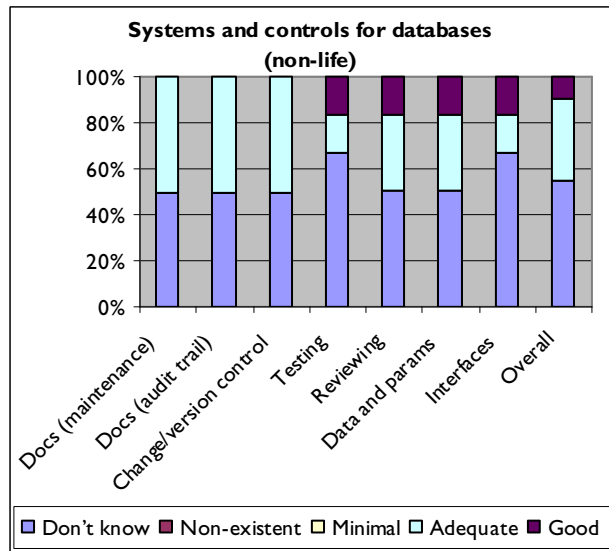
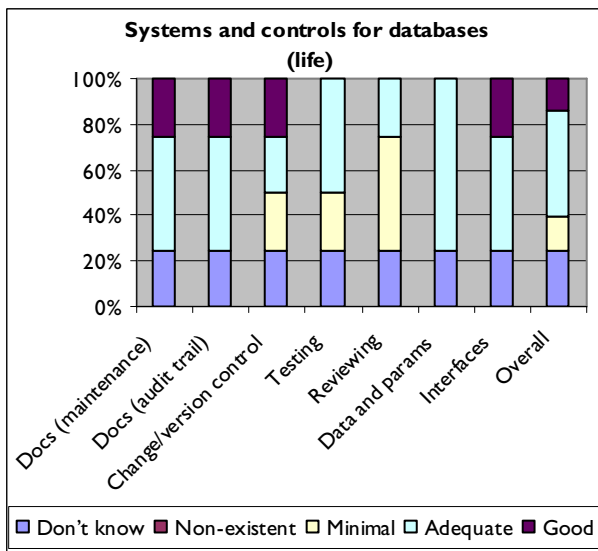
Just over a third of respondents have no direct involvement with the databases used in their ICAs (40% for life, 33% for non-life), while just under a fifth develop database applications themselves (20% life, 17% non-life). Personal database applications such as Access or FoxPro are used in 9 of the 11 cases, with enterprise applications such as SQLServer being used in the remaining two.

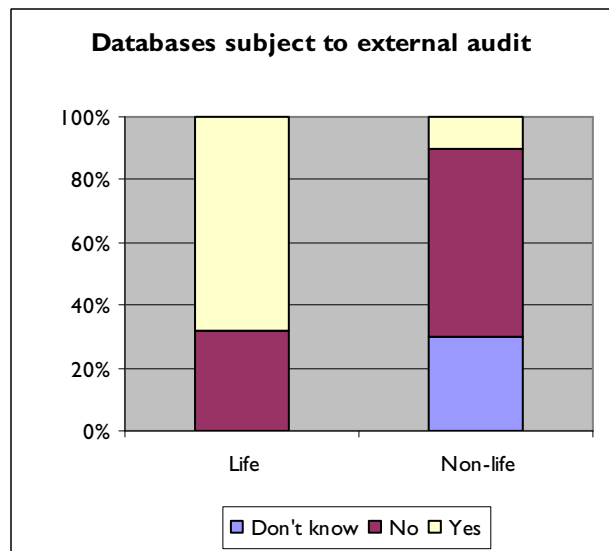
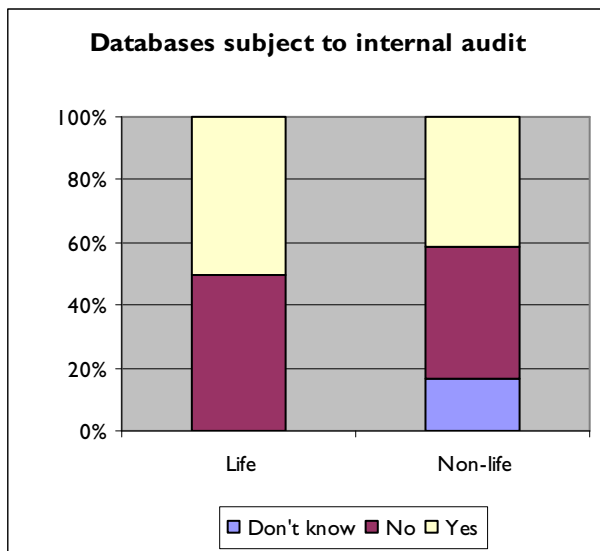


Over 40% of the respondents don't know about the systems and controls surrounding the databases used in their ICAs. Of those who do know, none believe them to be non-existent.



More respondents in life are prepared to rate their systems and controls than in non-life (75% compared to 45%). However, the number of respondents is small, so any detailed comparison is likely to be unreliable.





Overall, about 40% of the database applications are known to be subject to both internal and external audit. However, only 8% of non-life databases are subject to external audit, compared to 50% of life databases. Again, these figures may be misleading because of the small number of responses.

3.7 Statistical packages

5 respondents answered the questions on statistical packages, compared to the 3 who said they use them in the overview section. The packages used are Matlab, R, SAS and Minitab. SAS is the only one used by more than one respondent. There are several possible reasons for the low response rate:

- Little explicit statistical analysis is performed in the course of doing ICAs
- Most statistical analysis is performed by other specialist packages (actuarial models, stochastic models, or other specialist models)
- Most statistical analysis is performed by spreadsheets

It is impossible to tell which, if any, of these are significant factors.

Of those that rated the systems and controls around their statistical packages, the majority rated them as adequate in all categories (2 or 3 respondents).

Only one respondent said that the work done using a statistical package was subject to internal audit. No respondents said that it was subject to external audit.

Appendix: Survey questions

Software use in ICAs

I Introduction

Thank you for taking part in this survey, which is intended to investigate how end-user software is being used for the financial models at the heart of the ICA process.

Completing the survey should take under 15 minutes. There are 45 questions on 9 pages (including this one). You can answer as many or as few questions as you like. Please ignore those questions that don't apply to you.

You can answer the questions in any order (use the "Prev" and "Next" buttons at the bottom of each page). Use the "Exit this survey" button at the top of each page to leave the survey at any time. You can return to your answers and change them at any time until 15th July 2006, when I will be collecting and analysing the results.

A full analysis of the survey results will be available to all survey participants. If you wish to receive it, please enter your email address on the last page of the survey.

If you have any questions about the survey please email me.

2 Your role

This is page 2 of 9.

1. Which of the following do you work for?

- Insurance company
- Consultant
- Other (please specify)

2. Are you an

- Actuary?
- Actuarial student?
- Accountant?
- Other (please specify)

3. Which types of business do you prepare ICAs for?

- Life business only
- Non-life business only
- Both, but mainly life business
- Both, but mainly non-life business
- Other (please specify)

4. How many ICAs have you been involved in during the last 12 months?

- 0
- 1
- 2-4
- 5+

5. How long have you been in your current field (life or non-life)?

- 0-2 years
- 3-5 years
- 6-9 years
- 10+ years

6. What do you consider to be your role in the ICA process?

- I work for a company, and am in overall charge of the ICA for my company
- I work for a consultant, and am in overall charge of our ICA work for one or more clients
- I lead a team involved in ICA work
- I am a member of a team involved in ICA work
- Other (please specify)

7. Any other comments you'd like to make about your role in the ICA process

3 What software do you use?

This is page 3 of 9. It asks some basic questions about what software you use for ICAs. There will be more detailed questions about each type of software later in the survey.

8. Which types of software are used in the ICAs you work on?

- Actuarial model
- Other specialist model (eg Economic scenario generator, DFA, catastrophe model ...)
- Spreadsheet
- Database
- Statistical package (eg, SAS, S-Plus, SPSS, R, ...)
- Other (please specify)

9. Do you use stochastic models in your ICAs?

- Actuarial model
- Other specialist model
- Other (please specify)

10. Which types of software communicate with each other? (For example, by writing files that one of the other types reads; or providing a spreadsheet add-in; or querying a database). Please check the relevant boxes. Don't worry about making the matrix symmetrical.

| | Actuarial model | Other specialist model | Spreadsheet | Database | Statistical package | Other |
|------------------------|-----------------|------------------------|-------------|----------|---------------------|-------|
| Actuarial model | | | | | | |
| Other specialist model | | | | | | |
| Spreadsheet | | | | | | |
| Database | | | | | | |
| Statistical package | | | | | | |
| Other | | | | | | |

11. How would you rate the importance of each type of software in your ICA work?

| | Vital | Important | Useful | Waste of time | N/A |
|------------------------|-------|-----------|--------|---------------|-----|
| Actuarial model | | | | | |
| Other specialist model | | | | | |
| Spreadsheet | | | | | |
| Database | | | | | |
| Statistical package | | | | | |
| Other | | | | | |

12. Please rank the types of software in the order of the amount of time and effort they consume during the ICA process.

| | 1 (most) | 2 | 3 | 4 | 5 | 6 (least) | N/A |
|------------------------|----------|---|---|---|---|-----------|-----|
| Actuarial model | | | | | | | |
| Other specialist model | | | | | | | |
| Spreadsheet | | | | | | | |
| Database | | | | | | | |
| Statistical package | | | | | | | |
| Other | | | | | | | |

13. Any other comments you'd like to make about the relative importance of the different types of software

4 Actuarial models

This is page 4 of 9.

Please answer these questions with reference to the actuarial model that is most important for you: for example, the one that is most heavily used in the ICAs you are involved with, or the one that you personally work with most often.

14. What is your personal involvement with the actuarial model in the ICA process?

- I develop or maintain the model
- Other people in my team build and run the model
- People in other teams build and run the model
- The model is built and run by external consultants

- Other (please specify)

15. Which of the following best describes the actuarial modelling system?

- I work for a company, and the purpose-built system was developed in-house
- I work for a company, and the purpose-built system was developed for us by consultants
- I work for a consultant, and the system was developed in-house (but is not sold to clients)
- I work for a consultant, and the system was developed for us by specialist software developers (but is not sold to clients)
- I work for a consultant, and the system is one that we develop and sell
- It's a commercially available system
- Other (please specify)

16. How do you think the FSA would rate the systems and controls around the actuarial model?

Non-existent Minimal Adequate Good Don't know

Documentation (for model maintainers)

Documentation (for audit trail)

Change and version control

Systematic testing

Systematic reviewing

Use of data and parameters

Interface with other models or software

17. Are the systems and controls for the actuarial model part of the audit universe?

Yes No Don't know

Internal auditors

External auditors

18. Any other comments you'd like to make on your use of actuarial models and the systems and controls around them

5 Other specialist models

This is page 5 of 9, and marks the half way point of the survey.

19. What specialist models are used in the ICAs you are involved in?

- Economic scenario generator
- DFA
- Catastrophe model
- Other (please specify)

Please answer the following questions with reference to the specialist model that is most important for you: for example, the one that is most heavily used in the ICAs you are involved with, or the one that you personally work with most often.

20. What is your personal involvement with the model in the ICA process?

- I develop or maintain the model
- Other people in my team build and run the model
- People in other teams build and run the model
- The model is built and run by external consultants
- Other (please specify)

21. Which of the following best describes the specialist model?

- I work for a company, and the purpose-built system was developed in-house
- I work for a company, and the purpose-built system was developed for us by consultants
- I work for a consultant, and the system was developed in-house (but is not sold to clients)
- I work for a consultant, and the system was developed for us by specialist software developers (but is not sold to clients)
- I work for a consultant, and the system is one that we develop and sell
- It's a commercially available system
- Other (please specify)

22. How do you think the FSA would rate the systems and controls around the model?

Non-existent Minimal Adequate Good Don't know

Documentation (for model maintainers)

Documentation (for audit trail)

Change and version control

Systematic testing

Systematic reviewing

Use of data and parameters

Interface with other models or software

23. Are the systems and controls for your specialist models part of the audit universe?

Yes No Don't know

Internal auditors

External auditors

24. Any other comments you'd like to make on your use of other specialist models and the systems and controls around them

6 Spreadsheets

This is page 6 of 9.

25. What is your personal involvement with spreadsheets in the ICA process?

- I develop or maintain spreadsheets
- I use spreadsheets developed by others

- I have no direct involvement with spreadsheets
- Other (please specify)

26. What spreadsheet packages do you use?

- Excel
- Lotus
- Quattro Pro
- Other (please specify)

27. What spreadsheet add-ins do you use?

- Standard Excel add-in, such as Analysis Toolpak, Solver, etc
- Monte Carlo add-in, such as @Risk, Crystal Ball, etc
- Statistical add-in, such as XLStat, WinSTAT, etc
- Add-ins that are supplied with another software package (eg, with actuarial model)
- In-house add-in
- Auditing or testing add-in, such as XLSior, Spreadsheet Detective, SpACE, etc
- Other (please specify)

28. How do you think the FSA would rate the systems and controls around your spreadsheets?

Non-existent Minimal Adequate Good Don't know

Documentation (for model maintainers)
 Documentation (for audit trail)
 Change and version control
 Systematic testing
 Systematic reviewing
 Use of data and parameters
 Interface with other models or software

29. Are the systems and controls for your spreadsheets part of the audit universe?

Yes No Don't know

Internal auditors
 External auditors

30. Any other comments you'd like to make on your use of spreadsheets and the systems and controls around them

7 Databases

This is page 7 of 9.

31. What is your personal involvement with databases in the ICA process?

- I develop or maintain a database

- I use a database developed by others
- I have no direct involvement with databases
- Other (please specify)

32. What databases are used in the ICAs you are involved with?

- Personal database, such as Access
- Enterprise database, such as Oracle
- Other (please specify)

33. How do you think the FSA would rate the systems and controls around your databases?

Non-existent Minimal Adequate Good Don't know

Documentation (for model maintainers)
 Documentation (for audit trail)
 Change and version control
 Systematic testing
 Systematic reviewing
 Use of data and parameters
 Interface with other models or software

34. Are the systems and controls for your databases part of the audit universe?

Yes No Don't know

Internal auditors
 External auditors

35. Any other comments you'd like to make on your use of databases and the systems and controls around them

8 Statistical packages

This is page 8 of 9.

36. What is your personal involvement with statistical packages in the ICA process?

- I perform analysis using a statistical package
- I work with analyses performed by other people using a statistical package
- I have no direct involvement with statistical packages
- Other (please specify)

37. What statistical packages are used in the ICAs you are involved with?

- GLIM
- Matlab
- R
- SAS

- S-Plus
- SPSS
- Other (please specify)

38. How do you think the FSA would rate the systems and controls around your statistical packages?

Non-existent Minimal Adequate Good Don't know

Documentation (for model maintainers)
 Documentation (for audit trail)
 Change and version control
 Systematic testing
 Systematic reviewing
 Use of data and parameters
 Interface with other models or software

39. Are the systems and controls for your statistical packages part of the audit universe?

Yes No Don't know

Internal auditors
 External auditors

40. Any other comments you'd like to make on your use of statistical packages and the systems and controls around them

9 Further information

This is page 9 of 9. It's the last page!

Thank you very much for participating in this survey. If you'd like a copy of the full analysis of the survey results (available only to participants) please enter your email address below.

Please email me if you have any questions about the survey.

41. What is your email address? (You must supply an email address if you'd like a copy of the survey results)

42. Check the box if you do not wish to receive my monthly email newsletter on user-developed software, risk and related matters.

- No newsletter

43. How did you find out about this survey?

- Louise Pryor's newsletter
- Louise Pryor's web site
- The Actuary magazine
- Word of mouth
- Other (please specify)

44. I'd like to know more about how you can help me with

Yes No

Systems and controls for end-user software

More effective and productive spreadsheet development

Spreadsheet reviews

Training

45. Any other comments or questions

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