



# ACST2055

## Contingent Payments

Session 2, In person-scheduled-weekday, North Ryde 2023

*Department of Actuarial Studies and Business Analytics*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff Colin Zhang <a href="mailto:colin.zhang@mq.edu.au">colin.zhang@mq.edu.au</a>
Credit points 10
Prerequisites (ACST202 or ACST2002) and (STAT272 or STAT2372)
Corequisites
Co-badged status
Unit description This unit covers the analysis of cash flows dependent on uncertain events due to mortality and other factors. It introduces the concept of the expected present value of payments under various life insurance contracts, including whole life, term and endowment assurances; immediate and temporary annuities; and deferred assurances and annuities. The standard international actuarial notation in life insurance is used extensively. Probability models and life tables are used to calculate the expected present values accurately based on ultimate or select mortality. Furthermore, important concepts of pricing and reserving for future contingent liabilities are discussed. Equations of value are established to calculate net premiums. Prospective and retrospective net premium reserves required to meet future liabilities are determined and compared. Techniques for the valuation of annuity and assurance products involving two lives are developed. Students gaining a credit average in both ACST2002 and ACST2055 (minimum mark of 60 on both units) will satisfy the requirements for exemption from the professional subject CM1 of the Actuaries Institute.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Interpret and apply simple survival models as well as ultimate and select mortality rates.

**ULO2:** Apply contingent payment techniques to determine actuarial present values and

variances of benefits for simple life insurance contracts and for contracts contingent on two lives.

**ULO3:** Calculate premiums and policy values for various life insurance contracts, both with and without allowance for operating expenses.

**ULO4:** Analyse the profit arising from life insurance contracts in simple scenarios.

**ULO5:** Identify key unit concepts and to integrate them to solve and analyse novel problems.

## General Assessment Information

### Late Assessment Submission Penalty (written assessments)

Unless a *Special Consideration* request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submissions of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](#).

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#"><u>Online Quiz</u></a>	5%	No	Week 3 (August 4)
<a href="#"><u>Assignment</u></a>	15%	No	Week 8 (September 29)
<a href="#"><u>Class Test</u></a>	20%	No	Week 10 (October 11)
<a href="#"><u>Final Exam</u></a>	60%	No	Exam period

### Online Quiz

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 2 hours

Due: **Week 3 (August 4)**

Weighting: **5%**

You should complete the quiz online, available on iLearn.

On successful completion you will be able to:

- Interpret and apply simple survival models as well as ultimate and select mortality rates.

## Assignment

Assessment Type **1**: Quantitative analysis task

Indicative Time on Task **2**: 15 hours

Due: **Week 8 (September 29)**

Weighting: **15%**

This is an individual assignment which focuses on problem solving using Excel spreadsheet.

On successful completion you will be able to:

- Interpret and apply simple survival models as well as ultimate and select mortality rates.
- Apply contingent payment techniques to determine actuarial present values and variances of benefits for simple life insurance contracts and for contracts contingent on two lives.
- Calculate premiums and policy values for various life insurance contracts, both with and without allowance for operating expenses.
- Identify key unit concepts and to integrate them to solve and analyse novel problems.

## Class Test

Assessment Type **1**: Quiz/Test

Indicative Time on Task **2**: 10 hours

Due: **Week 10 (October 11)**

Weighting: **20%**

The test will be approximately 90 minutes, to be held during class time.

On successful completion you will be able to:

- Interpret and apply simple survival models as well as ultimate and select mortality rates.
- Apply contingent payment techniques to determine actuarial present values and variances of benefits for simple life insurance contracts and for contracts contingent on two lives.
- Calculate premiums and policy values for various life insurance contracts, both with and without allowance for operating expenses.

- Analyse the profit arising from life insurance contracts in simple scenarios.
- Identify key unit concepts and to integrate them to solve and analyse novel problems.

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 28 hours

Due: **Exam period**

Weighting: **60%**

The final examination will be closed book, a three-hour written paper with ten minutes reading time, to be held during the University Examination period.

On successful completion you will be able to:

- Interpret and apply simple survival models as well as ultimate and select mortality rates.
- Apply contingent payment techniques to determine actuarial present values and variances of benefits for simple life insurance contracts and for contracts contingent on two lives.
- Calculate premiums and policy values for various life insurance contracts, both with and without allowance for operating expenses.
- Analyse the profit arising from life insurance contracts in simple scenarios.
- Identify key unit concepts and to integrate them to solve and analyse novel problems.

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

It is intended that learning this session will be a combination of pre-recorded online and face-to-face.

The timetables for classes can be found on the University website at: [Timetable 2023](#)

Pre-recorded lectures will be made available early in the week and students are expected to

have watched/listened to them prior to attending any live or face-to-face classes.

Classes on tutorial questions will commence in week 2 of the session. Students are expected to have attempted the previous weeks tutorial questions before coming to this class.

### Required and Recommended Texts and/or Materials

No textbooks are prescribed for this unit. Detailed notes, exercises and solutions are available on the unit's web site.

### Technology Used and Required

You will require a calculator. For the final exam, you may only use non-programmable calculators which are not able to store text.

You will also need to be able to construct spreadsheets for tutorial exercises. You will also be required to use a spreadsheet for the assignment. We do not prescribe any particular brand of spreadsheet, although materials will be provided in MS Excel.

You require access to a computer to access material on the unit's iLearn web site.

### Unit Webpage

Course materials, including pre-recorded lectures, are available on the iLearn page.

To access the teaching website, go to [iLearn](#) and login using your usual login and password.

## Unit Schedule

Week	Week Begins	Topics covered in lectures	Assessment
1	24 Jul	Life tables and survival models	
2	31 Jul	Valuing single payment benefits	
3	7 Aug	Valuing life annuities	Quiz
4	14 Aug	Select mortality Net premiums	
5	21 Aug	Policy values	
6	28 Aug	Variable benefits	
7	4 Sep	Operating expenses Profit testing	
----- 2 week study break -----			

8	25 Sep	Participating policies	Assignment
9	2 Oct	Analysis of profits Profit loading	
10	9 Oct	Joint life and last survivor statuses (class test)	Class test
11	16 Oct	Joint life and last survivorship benefits	
12	23 Oct	Contingent and reversionary benefits	
13	30 Oct	Revision	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA

student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

### The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes



## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.