

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

August 2016

Subject CA3 – Communications

Paper 2

Time allowed: 2 hours

INSTRUCTIONS TO THE CANDIDATE – ONLINE VERSION

1. *The work you submit MUST be saved in Microsoft PowerPoint 2007 format, e.g. using the pptx file extension.*
2. *You have two hours to prepare and upload your exam attempt.*
3. *You may print one copy of your slides in preparation for giving the presentation tomorrow. You are not permitted to make any further copies of your presentation.*
4. *Copies of Formulae and Tables and core reading for subjects CT1–CT8 inclusive and CA1 will be available electronically during the exam. These documents are for your use during the exam period only and not for general use. No other material can be referred to.*
5. *In addition to this paper you should have available your own electronic calculator from the approved list, <https://www.actuaries.org.uk/studying/prepare-your-exams/authorised-calculators>.*
6. *You are not permitted to use the internet to help you during the exam.*
7. *You are required to work through the exam assignment without assistance from another person. You are reminded that by undertaking this exam you are bound by the Institute and Faculty of Actuaries' Examinations Rules and Regulations. By submitting your files you are confirming that all material is entirely your own work and you wish this to be taken into account for this assessment. Only the first submission will be accepted.*
8. *Save your work regularly. Saving your work is your responsibility so failure to do so will not be a significant mitigating circumstance.*
9. *At the end of the exam, save your presentation and follow the upload instructions that have been provided. All related material that you have printed including slides, notes, etc. must be confidentially stored until we have informed you to delete/destroy them once the exam is over. Do Not log off the application until you receive confirmation of receipt from the Online Education Team.*
10. *If you encounter any difficulties please email online_exams@actuaries.org.uk or call the Online Education Team on +44 (0)1865 268255.*
11. *Professional behaviour is mandatory and no material relating to the exam may be disclosed or discussed with others, nor used in a further attempt at the exam. Failure to comply with this will be deemed to be a breach of the examination regulations and may result in disciplinary action.*

PLEASE NOTE THAT THE CONTENT OF THIS PAPER IS CONFIDENTIAL AND STUDENTS ARE NOT TO DISCUSS OR REVEAL THE CONTENTS UNDER ANY CIRCUMSTANCES.

You are a trainee actuary working in the government department responsible for the compilation of national statistical data in a developing country. You work in the department responsible for the calculation of price inflation statistics. The main price inflation statistic used in this country is known as the Market Prices Index, or MPI.

The department's training program for new staff aims to provide an overview of its activities. Your manager, Vishal, has asked you to make a short presentation about MPI. He has sent you the following email:

Sabina,

As you know, our training course is coming up soon and I'd like you to deliver a presentation for the price inflation slot on the Market Prices Index (MPI). The training is intended to provide our new colleagues with a broad awareness of our work and how it's applied in the outside world. Although they have a basic knowledge of mathematics, not all of them have technical backgrounds. For example, our colleagues in the public relations department need to field queries from external sources such as journalists – so take care to explain clearly any technicalities.

The topics and issues we need to cover include:

- *An introduction to the nature and purpose of price inflation indices, giving brief examples of how they are used.*
- *An illustration of the structure of the MPI. We need to bring out the “hierarchical¹” structure of the goods & services within the index showing the key Divisions. Perhaps use a diagram to illustrate this based on the composition of the MPI below.*
- *Comments on how the Divisions are weighted and how those weights are determined.*
- *Numerical examples of how an index is calculated using the weights. I suggest you do this for the “All Items MPI” both at December 2014 and December 2015. Please also show how the index at both these dates is used to calculate the annual rate of inflation over the year to December 2015.*
- *You should also illustrate the inflation rate in recent years and make any appropriate comments.*

Please remember that the trainees are not mathematicians and so any illustrations should be simple.

One of our actuarial students has collated some information that you can make use of, including a summary of the current composition of the MPI. You could use an extract from that summary to illustrate the structure I have mentioned above.

He has also provided some samples of historic data. You should find some of this information useful to illustrate your points.

*Vishal Ansar
Head of Statistics*

Draft a presentation to last 8–10 minutes.

¹ Hierarchical structure: a structure in which groups or classes are arranged in order of rank.

Price indices

The overall purpose of price indices is to indicate both the level of and changes in prices within an economy. These are useful for employers in setting the points on wage bands, wage negotiations etc. They are also useful for governments in calculating tax thresholds, budgets for departments, setting pension increases etc.

The table below compares the characteristics of the main index calculated by the statistics ministry – i.e. the Market Prices Index.

	<i>Market Prices Index (MPI)</i>
Calculation methodology	Arithmetic average of constituent prices: $\sum_{i=1}^N w_i \times p_i^t$ where w_i weight of Division i at time t p_i^t = price of Division i at time t and N = number of Divisions
Coverage	Includes basic goods and services relevant to typical households and foreign visitors.
Uses of “All Items MPI”	Up-rating of wages of government employees; tax thresholds applicable to all citizens, etc.
Publication frequency	Monthly
First published	1995

Sample of historic data for MPI

Table 1 shows the data applicable for December in each year.

The rate of inflation between time t_1 and t_2 , ($\text{Inflation}_{t_1, t_2}$) is given by the general formula:

$$\text{Inflation}_{t_1, t_2} = \frac{I_{t_2}}{I_{t_1}} - 1 \text{ (usually expressed as a percentage),}$$

where I_t is the relevant MPI value at time t .

Alternative indices can be calculated including indices based on a geometric mean. For information, a geometric index using the same elements would use the following formula:

$$\prod_{i=1}^N \left(\frac{p_i^t}{p_i^0} \right)^{w_i}$$

Table 1: Annual “All Items MPI” data for December each year

	“All Items MPI”	
Year	<i>Index value</i>	<i>Inflation over preceding year</i>
1995	190.0	
1996	192.8	1.5%
1997	197.4	2.4%
1998	202.5	2.6%
1999	206.2	1.8%
2000	211.9	2.8%
2001	219.9	3.8%
2002	226.0	2.8%
2003	231.7	2.5%
2004	238.4	2.9%
2005	247.4	3.8%
2006	261.8	5.8%
2007	280.4	7.1%
2008	295.0	5.2%
2009	303.8	3.0%
2010	310.5	2.2%
2011	318.7	2.6%
2012	324.2	1.7%
2013	322.1	−0.6%
2014	323.7	0.5%
2015	344.7	6.5%

The Market Prices Index (MPI)

Table 2 shows how the main index, known as the “All Items MPI”, is comprised of four weighted Divisions (Food & drinks, Clothing, Household goods & services and Transport). Table 2 also shows the price levels for each Division in December 2014 and December 2015 and illustrates how the “All Items MPI” is calculated.

Table 3 illustrates how each of these Divisions contains a range of representative items. It also shows a sample of these representative items.

The “All Items MPI” is the most commonly used index in the developing country.

How the weights are determined

The weights shown for each Division are the (estimated) relative expenditure shares of each group of commodities collected from household expenditure surveys and National Accounts sources. These take account of expenditure of domestic private households as well as foreign visitors. The weights are reviewed and updated periodically to reflect changing trends, including new technology and changing preferences and habits. The intention is that the “shopping basket” reflects the relative importance of the different items.

Table 2: Sample sub-division data for period from December 2014 to December 2015

Division	Price (\$) (A)		Weight (%) (B)	(A) × (B) (2014)	(A) × (B) (2015)
	2014	2015			
Food & drinks	325	365	60	195.0	219.0
Clothing	105	105	14	14.7	14.7
Household goods & services	120	120	20	24.0	24.0
Transport	1500	1450	6	90.0	87.0
“All Items MPI”			100	323.7	344.7

The weightings have not changed between 2014 and 2015.

Two of the Divisions have had changes in the Prices of the Divisions between 2014 and 2015. The total of the Division prices at 2014 (before weights have been applied) is \$2,050. Similarly at 2015 the total Division prices have dropped to \$2,040.

Table 3: Composition of the Market Prices Index (MPI)

<i>Division</i>	<i>Weight within MPI (%)</i>	<i>Examples of representative items</i>
Food & drinks	60.0	Bread
		Rice
		Flour
		Meats
		Fish
		Dairy Products
		Vegetable oil
		Fruits
		Vegetables
		Coconuts
		Sugar
		Ice cream
		Herbs & spices
		Tea
		Coffee
		Mineral water
		Carbonated drinks
Clothing	14.0	Jeans
		Suit
		Shirts
		Shoes
Household goods & services	20.0	Actual rents for housing
		Paint
		Water supply
		Electricity
		Furniture
		Rugs & Carpets
		Technological devices
		Glassware
		Mobile Phones
		Power tools
Transport	6.0	Motor Vehicles
		Motorcycles
		Bicycles
		Selected spare parts & maintenance
		Petrol & Motor Oil
		Rail, bus, air fares
Total	100.0	

All of the figures and information provided may be assumed to be correct for the purposes of the question. You are not expected to comment on the shortcomings or suitability of the calculation of the Market Prices Index.

END OF PAPER