Framework for the development of an Individual Life mortality table in Egypt (Sept 2006)

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Index

1. Introduction

Insurance is the business of monitoring and understanding the underlying fundamentals of the risk factors. These underlying factors are not static and are influenced by many factors including marketing, underwriting, general population health, overall economy, etc.

The development of the individual table is proposed in 3 steps.
1. Collection of current context, objective and issuing of specifications
2. Validation and cleaning of data received
3. Construction of table.

Step one can be completed the end of October, 2006, Step two depends on the participants of the study and Step three will be one to two months.

It is also important to mandate someone to be responsible to move the process along. Without a strong mandate the time to complete the study will quickly move into years.

2. Background

2.1 Methodology

The project was conducted from Sept 10 to Sept 28 in Cairo. The methodology used was to initially gather data on the insurance situation in Egypt. Quickly a developmental framework was proposed and then meetings with individual companies where initiated. Based on meetings a new proposal was presented. The most basic information requested from companies was a map of policy, claims and underwriting information held on computer systems as well as basic policy information. (See Appendix 1). When the data maps are received a draft specification of data request will be sent out. Appendix 2 list contacts established.

2.2 Egyptian demographics and economy

CIA fact book (from web site Sept 2006)
- Population 78.9 Million (July 2006)
  - 33% 0-14
  - 63% 15-64
  - 4% 65+
- Median age 24
- Birth rate 22.9 per M, Fertility rate 2.83
- Infant Mortality rate 31.3 per M
- Life expectancy 71.3, Male 68.8, Female 73.9
- GDP 92.6 Billion or $1175 per capita
- **PPP 3.3 times official exchange rate**
- Population below Poverty Line 20%
  - Highest 10% 2934 per capita per year
  - Lowest 10% 516 per capita per year
  - GINI index 34.4 (relatively good distribution of income)
- Labor force 21.3 million (2005)
- Inflation 4.9% (2005)
- Budget $20.3 billion revenue, $27.7 billion expenses, deficit 8% of GDP
- Public debt 104.7% of GDP
- Exports 14.2 billion, 15% of GDP

WHO (from web site Sept 2006)
- Population 74 Million
- GDP PPP 4,274
- Life expectancy 66 70 m/f
- Child mortality 36/36 m/f
- Health exp PPP $235 per capita or 5.8% GDP
- 57% private health care expenditure

2.3 Population mortality

Due to underwriting we would expect insured population to have better mortality compared to the population. However it is instructive to review improvements to population mortality for two principal reasons. First it provides clues to the potential changes in mortality of the sub segment of insured population. Secondly due to size it is more robust and credible indicating the mortality slope by age and gender.

Life Expectancy in Egypt, selected years

Year	Female	Male
1960	53.8	51.6
1976	57.7	52.7
1986	63.5	60.5
1991	66.4	62.8
1996	69.0	65.1
2001	71.5	67.1
2006 (projection)	73.6	69.2

source CAPMAS

Life expectancy continues to improve over the years; however the rate of improvement is slowing down. In the last ten years male life expectancy has improved by 6.3% and females by 6.7%. We would expect the underlying mortality to also improve, however we have no clue how this improvement is distributed over ages.

WHO, 2001, Egyptian Population table and mortality					
	Male		**Female**		
Age range	**Population**	**nqx**	**Population**	**nqx**	**nqx Male/Female**
<1	867,520	0.0345	829,930	0.0328	105%
1-4	3,230,100	0.0116	3,086,200	0.0120	97%
5-9	3,979,130	0.0041	3,802,620	0.0033	125%
10-14	4,172,170	0.0039	3,983,810	0.0030	129%
15-19	3,975,500	0.0055	3,760,770	0.0038	142%
20-24	3,355,880	0.0068	3,154,040	0.0046	149%
25-29	2,754,340	0.0077	2,576,800	0.0052	149%
30-34	2,504,560	0.0100	2,359,050	0.0064	156%
35-39	2,212,400	0.0133	2,105,350	0.0088	151%
40-44	2,038,200	0.0218	1,990,130	0.0128	170%
45-49	1,749,170	0.0362	1,764,560	0.0227	160%
50-54	1,281,380	0.0633	1,336,410	0.0406	156%
55-59	881,000	0.0888	955,460	0.0658	135%
60-64	698,160	0.1305	792,460	0.1015	129%
65-69	543,690	0.2040	654,740	0.2021	101%
70-74	367,920	0.3223	474,600	0.3216	100%
75-79	218,150	0.3881	292,040	0.3605	108%
80-84	100,860	0.5393	140,830	0.5235	103%
85-89	29,980	0.7076	46,770	0.7052	100%
90-94	3,980	0.8084	7,370	0.8148	99%
95-99	210	0.8625	500	0.8697	99%
100+	5	1.0000	10	1.0000	100%

The WHO population mortality provides information on the mortality for rates for 5 year periods (with the exception of the first row which is a one year period) under the column nqx. This WHO table is useful to give us a preliminary mortality slope by age. Additionally it can be used later, when an Egyptian insured mortality table is developed to measure the impact of underwriting.

2.4 Regulatory environment

Attached to this document is a copy of the Egyptian Insurance Act. Article 37 states that mathematical reserves are based on the requirements of the Board of Regulators. The reserves must meet policyholder obligations. In discussions, the actuaries set the assumptions and the regulators may comment on the set assumptions occasionally requiring changes. Some actuaries did say that they where conservative on mortality assumptions and liberal on expense assumptions. It appears that the key assumptions are not set individually nor validated individually. The aim is to establish the overall policy liability without regard to the accuracy of the individual assumptions.

2.5 Insurance market

Individual insurance

The Egyptian individual insurance market has some very basic policy types such as Endowment and term insurance and more sophisticated products such as unit linked.

Individual Life policies as of June 30, 2006	
Company	**Number of policies**
Misr (estimate)	280,000
Al Chark (estimate)	280,000
National (estimate)	56,000
Suez Canal	3,934
Mohandes	7,630
Delta	7,588
ALICO	20,548
CIL	30,118
Allianz Life	34,624
Ace Life	1,382
NSGB	19,679
BUPA (new co.)	
Total	**741,503**

Source EISA, from annual fillings

The total in force policies are less then 1% of the population and less then 1.5% of the working age population. The number of policies in force is even lower as it is commonly understood that an insured may have several policies with one company. The average premium per policy was 1,662 LE in 2004-2005 an increase of 195% from 5 years

earlier. However there is a high lapse rate which ranges from 14% to 20% of overall policies in the past 4 years.

As of the time of this writing we do not have any sample individual policy types.

Group insurance

The Egyptian group insurance market mirrors the individual policy market by providing endowment and term life, in addition other benefits are provided such as accidental coverage and a total and permanent disability coverage. The EISA 2004-2005 annual report indicates premium of 643 million LE, an increase of 106% from 5 years ago.

Group Contract, Suez Canal Insurance
- Coverage Life, Accidental Death and Permanent total and partial disability
- Max age covered <60 at start of contract.
- Lump sum benefit.
- Premiums annual, and quarterly for new ees
- No medial examination report up to 75,000 LE coverage
- Exclusion of coverage (however premium refund)
  - murder by beneficiary
  - death by capital punishment
  - 2 year suicide exclusion
  - Natural catastrophe
  - Terrorism
- Covers
  - Traveling risk if commercial travel
  - War risk for civilians
- Data required: Name, Date of Birth, Salaries
- Permanent Total Disability
  - Loss of sight in both eyes, both legs or feet, both arms or hands
  - Loss of one hand and one leg, one arm and one foot, one hand and one foot, one arm and one leg.
  - Disablement of one organ totally and finally from functioning.
- Claim documents
  - Death claim
    - Death certificate or certified copy
    - Birth certificate or certified copy
    - Medical certificate mentioning cause of death
  - Permanent disability
    - Birth certificate or certified copy
    - Medical report
    - Certified copy of retirement decision
  - Partial disability
    - Copy of Police report and final decision of the prosecution
    - Medical report determining the % of disablement.(within a year of event)

2.6 Current Individual Life Mortality tables

In discussion with actuaries of various companies we learned that companies use the British ultimate tables from various periods. As the prevalence of policies are issued to males, that genders mortality is used in reserve calculation. A common table used is A49-52, with a few using A67-70. The table below compares mortality rates for the British individual tables with a derived annual mortality rate from the WHO 2001 population table. We would expect to see insured population with better mortality compared to population tables due to underwriting and selection.

Selected mortality rates per thousand			
	Male Ultimate tables		
age	**A24-29**	**A49-52**	**A67-70**	**WHO 2001**
22	2.35	1.11	0.80	1.37
27	2.35	1.13	0.66	1.55
32	2.53	1.20	0.70	2.00
37	3.20	1.47	1.03	2.68
42	4.39	2.31	1.83	4.39
47	6.04	4.20	3.36	7.34
52	9.06	7.50	6.03	12.99
57	14.50	12.72	10.50	18.43
62	23.94	20.96	17.75	27.57
67	39.08	34.09	29.27	44.62

Actuaries have reported to this writer that the actual experience is favorable compared to the tables they use.

3. Mortality Table Construction

This section will outline requirements for the completion of an Egyptian mortality table. As will as sketch some of the information we will include in draft specifications

3.1 Scope and objective of individual mortality table

The first step in developing a table is to determine the objective of the table. What will be the use of this table, pricing or reserving? Which product will it be valid for, individual life or annuities? What types of individual life products are sold?

We propose that the objective of the table will be to provide a benchmark of Egyptian individual life mortality. Furthermore it can be the base for periodic updates to measure the evolution of individual insurance mortality.

The scope should be limited to individual life insurance for this first study.

3.2 Preconditions for table

To produce a credible table we would require 2.5 to 3.0 million life years exposure **per gender**. With policy count at hovering around 600,000 to 700,000 each year, this would require 5 years data from participating companies.

Once data is available we will determine a suitable select period. We would expect this initial table to produce at least a 3 year select period.

The data request will likely cover the period of July 1, 2001 to June 30, 2006. The time frame to receive data should be prior to June 30, 2007, to avoid interrupting financial year end of companies.

Finally EISA has appointed Mohamed Attalah to lead this project. Strong leadership and follow up will insure timely completion of this project.

Appendix 3 contains the letter sent to Chairman Adel Rabeh, with key priorities for the table construction.

3.3 Draft specifications for data request

The data request specifications will be completed once we have completed data maps (data fields) from all the companies that sell individual life. Appendix 1 illustrates the text of a letter sent to companies asking for the information.

The specification will have the following
- Introduction, describing the purpose and goals of the study
- Time tables for data submissions

- Study design
    - Policy file
    - Claims file
- Confidentially of individual company information.
- Analysis methodology
    - Data validation
        - Matching to financial systems
        - Other methods
    - Construction of raw table
        - Parameters studied
            - Select and ultimate period?
            - Gender?
            - Smoking status?
            - Cause of mortality?
            - Variations by company?
            - Variations by year of study?
            - Mortality by number or volume of insurance?
        - Issues in construction of table
            - Claims data by year of death
            - Multiple policies
            - Imaginary policies
            - Lapses
            - Insufficient data for certain parameters
    - Graduation of table
- Advisory panel role and members
- Data submission procedures
    - Documentation by company on potential issues
        - Product distribution methods
        - Robustness of data
    - Detailed data required for policy file
    - Detailed data required for claim file
    - Data mapping request

The final report will document each of the steps above as well as discuss future updates to the table.

3.4 Insurance Company Data

A study of the insurance company data systems is necessary to determine what parameters are on systems and the length of time data is retained. The policy and claims file will ask for some of the following information depending on availability:

- Policy information:
    - Policy number
    - Policy type, endowment, term, unit linked, etc.

- What are the product features and what options are provided
    - Term conversions
    - Guaranteed insurability
    - Unknown
    - Other
- What are current underwriting standards used by insurance companies
    - Non-medical
    - Paramedical
    - Medical
    - Unknown
- Gender
- Date of Birth
- Address
- Date policy sold
- Date policy terminated
- Termination reason
- Sum insured
- Date policy restated
- Health status, i.e smoker or non-smoker
- Recorded information on policy changes
- What other parameters are available or useful from all companies?
- Claims information:
    - Policy number
    - Date of death
    - Date claim received
    - Date claim settled
    - Cause of death coded in International Claims Diagnostic format
    - Other

3.5 Data validation and cleaning

When the participants provide data, it will have to be reviewed for overall adequacy and validated by companies and the study. The period of time required for depends on the priorities of the participants.

This step can be anywhere from 2 months to 2 years.

3.6 Mortality table construction

The final step would be the mortality table construction. The actual method used for construction would preferably be a seriatim approach (i.e. based on the exact data of every insured policy in the study period). Methods of determining credibility of data and graduation methods would be determined based on the final data submission.

The final step will take 1 to 2 months depending on the complexity of the task.

4. Expected time frame

The construction of a mortality table, in theory, does not take a long time. In practice the longest delays will be the data submission and data validation process. Both of these depend on insurance company resources.

Expected time frames for task	
Task	**time frame**
Data Maps (fields) from insurance companies	2 weeks
Data specification draft	2 weeks
Advisory committee review of specifications	1 week
Release of data specifications	1 day
Confirm with participants time frame for data delivery	1 month
Data reception	???
Data validation	2 months
Advisory committee review of data issues	1 week
Mapping data to common system	1 week
Construction of table	1 month
Advisory committee review of table construction	1 week
Finalize table	1 week
Documentation and distribution	1 week

5. Conclusion

This important project will bring substantial benefit to the Egyptian insurance market. Regulators and companies will finally have a benchmark to enable management to measure progress of their respective companies. Future follow up studies will enable participants to manage the changes in future mortality.

Attachment
-English version of the insurance act
-Mortality tables in use

Appendix 1 Letter requesting data maps

The letter below was sent to insurance companies on EISA letterhead requesting basic information.

Dear Mr. (insert name)

Re: Basic information requirements for feasibility of mortality study

EISA is proposing the development of an Egyptian mortality table. The first stage of this project requires an understanding of the type of information maintained by insurance companies.

For the above reason we are requesting the following information:
- Listing of information retained on computer systems for policy information.
  - For example: Name, gender, Date of birth, Policy number, endowment or term insurance, date of issue, date of termination, smoker or non smoker, issued with or without medical, etc. Please provide a complete list of data fields.
- Listing of information retained on computer systems for claims information.
  - For example: Policy number, Date of death, Date claim received, Date claim settled, Cause of death and coding system used, benefit provided such as accident, disability etc. Please provide a complete list of data fields.
- The length of time information is retained on computer systems.
- Underwriting rules on levels of policies issued without medical examination and changes in these rules since 2000.

In addition we would like a description of policies issued and benefits provided for Individual, Group and Health insurance. This later request is to provide a better understanding to the actuarial consultant Denis Garand of the group market.

Best regards,

Appendix 2 Contacts established

- EISA
  - Dr Adel M. Rabeh, Chairman
  - Gadha Samir
  - Farid Abdel Malek Metry, Actuary
  - Said Gabr, Actuary
  - Mohamed Atallah, Actuary
  - Mahmoud Salem, Actuary
  - Ragaii Hassan, IT Consultant
- Al Chark Insurance co.
  - Samir Wahba, CEO Life company,
  - Dr Said ??? Actuary,
  - and two other actuarial students.
- Alico
  - Wael A.H. Mohamed, Actuary
- MISR
  - Dr. Suzanne Shafik, Director and Chief Executive Computer & Information Tech
  - Mahmoud EL-Kholy, Actuary
  - Mahmoud Hassan, Actuary
  - Dr Sahn Said(?), Actuary
- Suez Canal
  - Dr Korayem F. Eldaif, Consulting actuary
- NSGB
  - Dr. Fayek H. Tawdros, Actuary
- Egyptian Society of Actuaries
  - Mohamed F. Amer, President

Appendix 3 Letter to Chairman

Memo to: Chairman Adel Rabeh   September 27, 2006

From: Denis Garand TAPRII
Egyptian Individual Life Mortality Table

From our initial assessment we believe that it will be possible to construct an Egyptian Individual Mortality table for males. A critical determinant for this project to advance will be the information retained electronically by the insurance companies.

We recommend the following steps
1. Send a letter to all companies with individual life insurance requesting a **data map** of the policy and claims information they retain on computer systems, the period these records are maintained, the changes to underwriting rules and brief descriptions of policy contract types. This should be received by Oct 12, 2006. Ghada Samir is managing this.
2. **Appoint an actuary from EISA** to be responsible for managing the Individual Life Mortality Table project.
   a. Requirements for this role: Actuary with ability to manage projects and make decisions on methodology for construction of mortality table.
   b. Responsibility: To develop the Egyptian Individual Life Mortality Table by April 2008.
      i. Step one: Issue data specifications by Oct 26, 2006
      ii. Step two: Negotiate time frame for data submission with participants by Nov 23, 2006
      iii. Step three: Receive data and validate data (2 to 3 months of work)
      iv. Step four: Construct Mortality table (1 to 2 month of work)
      v. Step five: Release table, with documentation of procedure
      vi. Step six: Develop procedures for periodic updating of table
   c. **Resources required: One Actuary and one IT person** to process data submissions, validate data from participating companies, and map data into a common useable format. They will also be required for the table construction.
3. **Appoint an advisory committee** with the mandate of providing advice only to the project manager. Final decisions on the project rest with the project manager.
   a. Representation: The committee should have 6-7 people from the following organizations, EISA, Insurance companies and Egyptian Society of Actuaries.
   b. Skills: There should be a variety of skills such as actuarial, IT and finance.
   c. Responsibility: Meetings convened by project manager when input is required for the project. Members to provide advice only.
   d. Expected work load: Should not exceed 1 week of time spread over the life of the project.

Best regards,