

DEMAND FOR ACTUARIAL RESOURCES IN SOUTH AFRICA

By **W Terblanche**

ABSTRACT

A key thrust of the Actuarial Society of South Africa's strategic plan is to promote diversity in actuarial demography. The aim is that the membership profile of the actuarial profession increasingly reflects the demographic profile of the country. More broadly, it is useful for a profession to consider how it has evolved, and how changes in the environment in which it operates may affect demand for its services in the future. In the last few years, as a result of economic development and growth in the services sector, as well as changes in the financial and insurance environment, including regulatory and technological developments as well as social and demographic changes, the demand for actuaries in South Africa has grown significantly. South Africa faces a number of challenges, such as a poorly educated workforce with high levels of unemployment and skills shortages. Poor socio-economic conditions for a large majority of the population result in high crime levels and emigration of skilled workers—a negative spiral. These are all interrelated and all affect economic growth and the demand for actuaries. While deterioration in these conditions negatively affects demand, global developments, such as international accounting standards and Solvency II, are creating demand. At the same time, emigration of actuaries and actuarial students creates shortages and a much tighter actuarial resource market.

This paper covers the current demographics of the membership of the Actuarial Society of South Africa, factors affecting demand, the results of research performed among South African employers of actuarial resources and models developed for projecting future demand. The models indicate moderate growth in demand in the short term.

KEYWORDS

Actuaries; demand; economic growth; unemployment; education; wider fields

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1. INTRODUCTION

1.1 This paper aims to consider the demand for actuarial resources in South Africa, including a study of factors influencing demand and the development of models to project future demand. The paper should be read together with Naidoo (unpublished).

1.2 Estimates of future demand for actuarial services provide some indication of job security and may assist in career planning. They should help actuaries to identify what skills they need to develop to ensure that their offerings remain relevant. They will also help employers and the industry to determine appropriate strategies to meet expected demand.

1.3 Estimates of future demand for professional services are often based on the regression and extrapolation of historical supply data over time. Price is an equalising factor for supply and demand and thus, if demand exceeds supply, the price (salaries) may rise, which, over time, results in an increased supply until supply equals demand. Vice versa, oversupply of skills may result in lower salaries (other things being equal). This method is based on the assumption that the net effect of factors that determined demand in the past will be similar in the future. This paper explores a range of factors that may influence demand for actuarial services and demonstrates how these have changed and how they may influence future demand. The price elasticity of supply and demand is influenced by factors such as the time it takes to complete a university degree, or to develop appropriate skills where demand is for a specific application or a new field, and the ability of employers to attract resources from other countries. These effects complicate estimates of demand. Models based on historical supply are therefore useful only for short-term estimates of future demand. It is therefore useful to consider longer-term projections of the supply of and demand for actuarial resources, based on specific, quantifiable and variable factors. The comparison of projected supply and demand may give an indication of the extent to which it may be necessary to adjust salaries in the future, and also give an opportunity for employers to consider alternative strategies.

1.4 In South Africa, in addition to normal considerations regarding supply and demand, employers in the financial services industry must meet the requirements of the Financial Sector Charter. This includes minimum targets for black and female employees at different levels of management. Accordingly, a key thrust of the Actuarial Society of South Africa's strategic plan is to establish diversity in actuarial demography. The aim is that the membership profile of the actuarial profession should increasingly reflect the demographic profile of the country's population. Information on the demand for actuaries by sex and ethnic group will assist in measuring progress and setting strategies to meet targets.

1.5 More broadly, it is useful for a profession to consider how it has evolved, and how changes in the environment in which it operates may affect future demand for its services.

It is also useful to consider specific fields of work in which actuaries have been involved, to consider how these are changing and hence what strategies could be applied to ensure that services remain available and relevant.

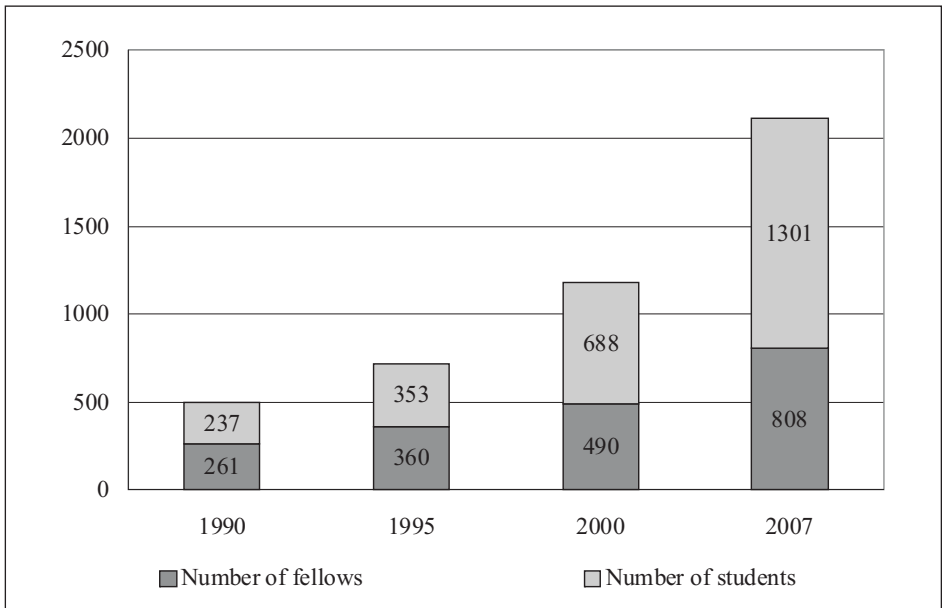
1.6 Section 2 covers the current demographics of the membership of the Actuarial Society of South Africa as well as some history. Section 3 considers factors affecting demand for actuarial resources. Section 4 presents the results of research performed among South African employers and Section 5 discusses models developed for projecting future demand.

1.7 In this paper an ‘actuarial resource’ means an actuary or an actuarial student other than a graduate or undergraduate student.

2. ACTUARIAL DEMOGRAPHY IN SOUTH AFRICA

2.1 Figure 1 shows changes in membership of the Actuarial Society of South Africa from 1990 to 2007.

Figure 1: History of membership of the Actuarial Society of South Africa¹



¹ Source: National report for the Actuarial Society of South Africa, Transactions of the International Congress of Actuaries 2002. Retrieved 9 November 2007 from <http://www.actuaries.org/EVENTS/congresses/Cancun/ica2002.htm>

2.2 The number of fellows (fully qualified actuaries) has grown at a rate of 6,9% a year over the period, while the number of students has grown at 10,5%. The growth rates from 1995 to 2007 were 7,0% and 11,5% a year for fellows and students respectively. This compares to growth rates in the United Kingdom (Institute and Faculty) membership (which includes most South African members) of 4% and 7% a year respectively from 1995 to 2004 (Pomery & Brown, unpublished). Based on more recent statistics received from the UK Actuarial Profession, the number of full-subscription students and fellows increased on average by 4,2% a year from 1997 to 2008. Membership of the Institute of Actuaries of Australia (IAAust) grew by 5% a year for fellows and 6% for students from 1992 to 2005.² More recent statistics received from the IAAust indicate growth of overall membership of 5,7% a year from 1995 to 2008 (5,2% for qualified actuaries and 6,6% for students). Growth of actuarial resources in South Africa has therefore been higher than in these countries.

2.3 The split between fellows and students in South Africa compared with UK and Australian membership as shown in Table 1.

Table 1: Proportional split of actuarial resources between fellows and students for South Africa, the UK and Australia

	Fellows	Students
South Africa (2007)	38%	62%
United Kingdom (2008)	53%	47%
Australia (2008)	61%	39%

2.4 Students represent a higher proportion of total membership in South Africa. UK membership relates to fellows and students paying the full-rate subscriptions only, and therefore probably excludes most South African and some other overseas actuaries and students. In the case of Australia, the proportion shown includes fellows only, and not accredited members and associates. Qualified actuaries and students from other countries have to become accredited members or associates before they can apply to become fellows of the IAAust (associates may be either qualified or part-qualified). The inclusion of these membership categories in the calculation of the above proportions may give very different results depending on whether it is assumed that associates are all fully qualified or all not. If it is assumed that they are not qualified, the proportions representing qualified actuaries and students are 46% and 54% respectively.

2 Presidential address, 2006: The evolution of the Profession, M.A. Stevenson, Institute of Actuaries of Australia. Retrieved from www.actuaries.asn.au

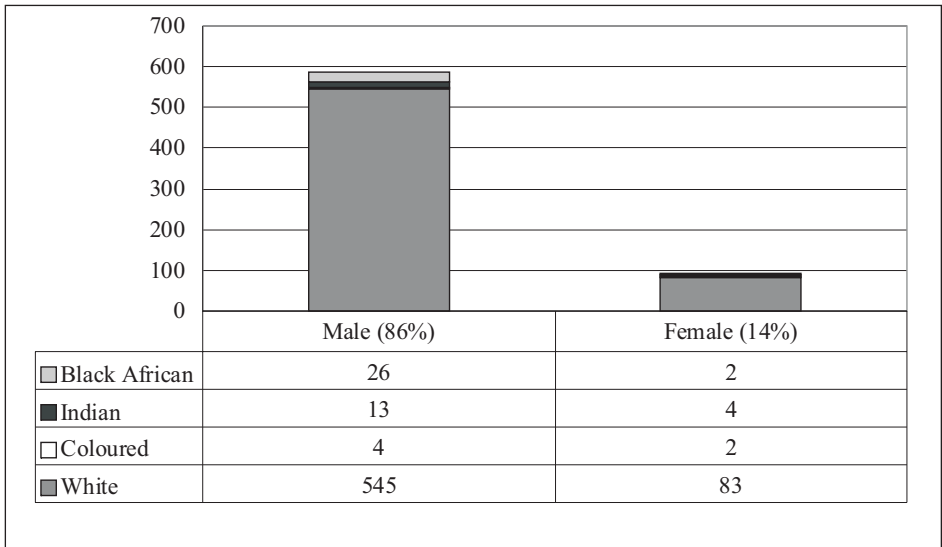
2.5 In or around 2004–2005, a total of 28% of UK members (Pomery & Brown, unpublished), and 23% of Australian members³ worked outside of their countries, compared with approximately 10% of South African fellows.⁴ The proportion increased to 40% for UK members in 2008.

2.6 The distribution of fellows of the Actuarial Society of South Africa in 2006 by sex and race is shown in Figure 2.

2.7 In 2006, 86% of the fellows in South Africa were male and 14% female, compared with 83% and 17% males and females respectively in the UK (Pomery & Brown, unpublished).

2.8 In 2006, 92% of fellows were white, compared with 9% of the general population.⁵ Statistics on the racial composition are not available for other countries.

Figure 2: Split of members of the Actuarial Society of South Africa in 2006 between sex and racial groups⁶



3 *ibid.*

4 National report for the Actuarial Society of South Africa, 2007, *supra*

5 Source: Statistical release P0302: Mid-year population estimates, Statistics South Africa, July 2007. Retrieved from www.statssa.gov.za

6 National report for the Actuarial Society of South Africa, 2007, *supra*

3. FACTORS AFFECTING DEMAND FOR ACTUARIAL RESOURCES

To estimate future demand for actuarial resources it is useful to consider the factors that have affected demand and how these may change. Factors discussed in this section are:

- macro-economic factors;
- changes in the financial environment;
- expansion of the role of actuaries into ‘wider fields’; and
- factors such as the image of the profession, and competition and demand from other professions.

3.1 MACRO-ECONOMIC AND SOCIO-ECONOMIC FACTORS

3.1.1 GROSS DOMESTIC PRODUCT AND ECONOMIC GROWTH

3.1.1.1 Ms L Traverso⁷ states:

“There is a clear relationship between economic growth and the amount of life insurance bought as well as the type of insurance product bought. As a market place becomes more sophisticated in its financial awareness and needs, so the insurance companies respond with more complex products to fill this demand.”

3.1.1.2 A country’s gross domestic product (GDP) is a measure of the quantity of goods and services produced in a year. Economic growth, or growth in GDP from year to year, is a measure of the success of a country’s economy (Roux, 2005).

3.1.1.3 The growth in real GDP per capita allows for the effect of inflation as well as for population growth. Positive growth in real GDP per capita should result *inter alia* in increased spending on insurance, increased savings and increased demand for wealth-management products and services, and therefore in an increase in the demand for actuarial expertise.

3.1.1.4 From 1996 to 2007, real GDP in South Africa grew by 3,7% a year, while population growth was 1,5% a year, resulting in real GDP per capita growth of 2,1% a year.⁸ An increase in the number of actuarial resources of at least 2% a year since 1996 would therefore be a reasonable expectation. The actual increase from 1995 to 2007 was 9,5% a year (7% for qualified actuaries and 11,5% for students), far in excess of real GDP growth per capita. One reason for the higher growth in actuarial resources is the changing structure of the South African economy from primary industries to knowledge-based services industries, discussed below.

3.1.2 ECONOMIC DEVELOPMENT

3.1.2.1 South Africa has undergone substantial social and economic change over the past half-century. As shown in Figure 3, the contribution to GDP by the primary

⁷ The current status of the Indian Actuarial Profession, L Traverso, DW Simpson (Asia Pacific).

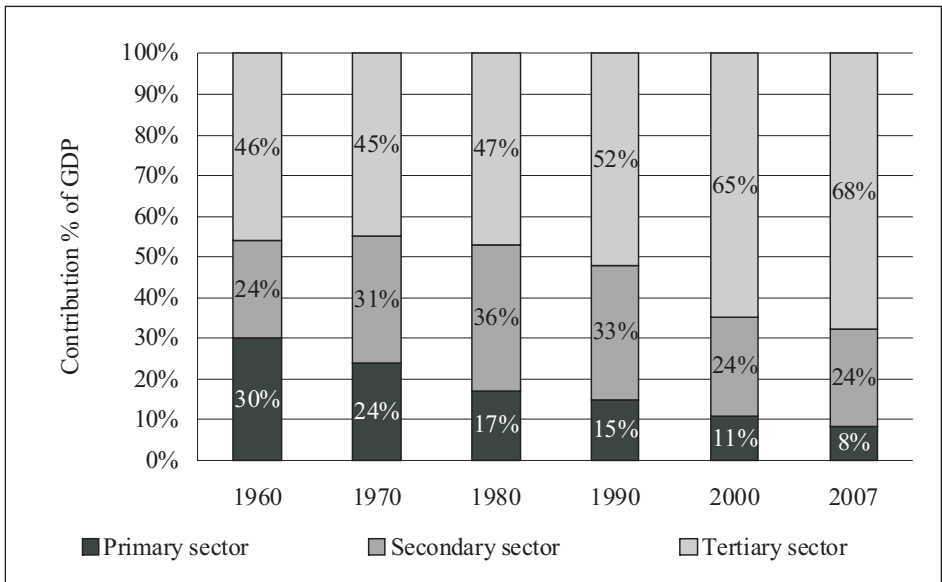
⁸ Source: Statistical release P0441: Gross domestic product: fourth quarter 2007, Statistics South Africa, 2008. Retrieved from www.statssa.gov.za

sector (agriculture and mining) as a percentage of total GDP has decreased over the past 47 years while the contribution by the tertiary sector has increased.⁹

3.1.2.2 The contribution by financial and business services, a sub-sector of the tertiary sector, has increased from 13% of GDP in 1960 to 23% in 2007.¹⁰ While the tertiary-sector GDP, excluding finance, real estate and business services, increased by 3,6% a year from 1993 to 2007, the growth in finance, real estate and business services was 5,5% a year. This compares with growth of the primary and secondary sectors of 0,4% and 3,4% a year respectively.

3.1.2.3 The financial and business services sector was the most important driver of jobs growth in the country's major cities.¹¹

Figure 3: History of the changes in the contribution of primary, secondary and tertiary sectors as a percentage of total GDP in South Africa



3.1.2.4 The move away from primary and secondary industries to tertiary industries means that demand for high-level staff grew much faster than for production workers and labourers. The growth in actuarial resources in South Africa was in line with the relative growth and increasing importance of the financial and business services sub-sectors.

9 Sources: Roux (2005); Statistical release P0210, Labour Force Survey. September 2007, Statistics South Africa 2008. Retrieved from www.statssa.gov.za

10 Sources: Roux (op. cit.); statistical release P0441 (supra)

11 Source: SACN (unpublished)

3.1.2.5 In terms of the proportion that the tertiary sector contributes to GDP, South Africa (68%) compares reasonably well with industrialised countries such as the United States of America (79%), the UK (73%), Australia (70%) and Canada (69%). However, GDP (at purchasing-power parity) per capita in South Africa (US\$10 600) is much lower than in these countries (between US\$33 000 and US\$46 000).¹² Hence, in per-capita terms, the services sector in South Africa is significantly smaller than in, *inter alia*, the UK, the USA, Australia and Japan.

3.1.3 ACTUARIAL DENSITY

3.1.3.1 Gribble (unpublished) estimated the number of actuaries required globally to meet a measure of demand. He used GDP as a measure of economic scale and growth, and as an indication of the need for actuaries. He defines ‘actuarial density’ as the number of actuaries divided by GDP (in millions of US\$), in order to assess the need for actuaries.

3.1.3.2 Gribble (op. cit.) assumed that, for the ‘Common Law’ group (the USA, the UK, Canada, Australia and South Africa), actuarial supply meets demand and he used the (weighted average) actuarial density of this group (0,1804%) to derive the demand (shortage of supply) for actuaries worldwide. As at the end of 2005 there were 42 800 fully qualified actuaries worldwide, i.e. a worldwide actuarial density of 0,1047%. Worldwide demand, based on 2005 figures, was therefore estimated at 73 800 (i.e. $42\,800 \times (0,1804 \div 0,1047)$)—a shortage of supply of around 31 000 qualified actuaries.

3.1.3.3 Gribble concluded that there was a significant shortage in the supply of actuaries relative to demand, particularly in developing countries.

3.1.3.4 To determine potential demand for actuaries in South Africa, one could apply similar methodology. Based on 2005 numbers, as per Gribble (op. cit.), it was found that about 1052 actuaries were required, compared with the 690 available (a shortage of nearly 35%), as follows:

$$690 \times (0,1817\% \div 0,1174\%) = 1\,052.$$

(The weighted average actuarial density of the USA, the UK, Canada and Australia, i.e. excluding South Africa, is 0,1817% and the actuarial density for South Africa is 0,1174%.)

3.1.3.5 If the target for South Africa were based on the UK actuarial density of 0,3124%, the total demand for actuaries in South Africa (in 2005) would come to 1836, as follows:

$$690 \times (0,3124\% \div 0,1174\%) = 1\,836.$$

(The number of actuaries relates to the number by location and therefore does not double-count members of both the Actuarial Society of South Africa and the UK Actuarial Profession.)

¹² Source: World Factbook, 2007. Retrieved from: <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html>

3.1.3.6 There are, however, a number of shortfalls in Gribble's (op. cit.) approach. First, it ignores the number of actuarial students and associates. In India, for example, the number of actuarial students and other members (3558 in 2005) significantly exceeded the number of qualified actuaries (205)¹³ and by excluding students, the total shortage may be overstated. Also, worldwide, associates are gaining more recognition as 'actuaries', so that in future, associates will become a more significant segment of the profession. Secondly, it is not clear why the actuarial density in the UK (0,31%) is significantly higher than in Canada (0,21%), the USA (0,13%) and Australia (0,19%), and thirdly, it is questionable whether the average actuarial density for the USA, the UK, Canada, Australia and South Africa is an appropriate benchmark.

3.1.3.7 In addition, by comparing the number of actuaries in a country relative to GDP only, no account is taken of other structural factors affecting demand, such as the level of economic development, economic stability, wealth and income distribution, the size and degree of saturation of markets, the effects of changes in social factors such as demography, the savings rate, education and risk awareness, the effects of regulatory changes etc. In South Africa the high level of unemployment means that only a small portion of the population enjoys the benefits of economic growth and this limits the size of the market. The South African savings rate is also low and general awareness of financial risk is poor (Swiss Re, unpublished a).

3.1.3.8 At best, Gribble's (op. cit.) application gives an indication of long-term demand for qualified actuaries in countries at an advanced stage of development.

3.1.3.9 One way to account for socio-economic differences between countries is to adjust the figures by the respective countries' human development index (HDI). The HDI was developed in 1990 under the United Nations Development Programme and is a measure of 'the ability of individuals within a country to live long, informed and comfortable lives'. The scale of the HDI ranges from zero (low development level) to 1 (high level). The HDI is a comparative measure of life expectancy, literacy, education and standard of living (as measured in GDP per capita in US dollars purchasing-power parity (PPP\$)).¹⁴

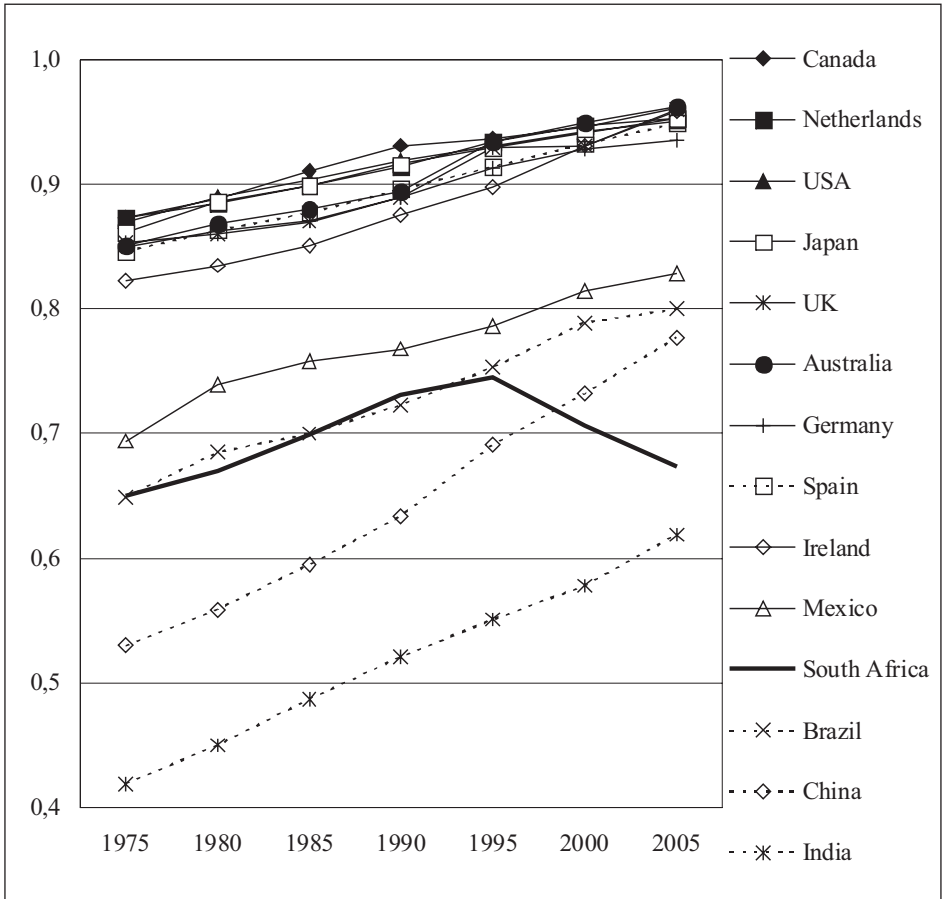
3.1.3.10 Figure 4 shows a comparison of the HDI from 1975 to 2005 for a number of countries. As shown in that figure, South Africa's HDI declined from 0,745 in 1995 to 0,674 in 2005, after steadily improving from 0,650 in 1975. The reduction is due to a drop in life expectancy resulting from AIDS (Hughes, unpublished). There is a significant difference in the HDI between population groups. In 1996 the HDI was 0,63 for black Africans, 0,70 for coloureds, 0,78 for Indians and 0,86 for whites.¹⁵

13 Traverso, supra

14 Sources: Wikipedia, http://en.wikipedia.org/wiki/Human_Development_Index; Human Development Index, Statistics South Africa, 1996. Retrieved on 30 March 2008 from www.statssa.gov.za/publications/P0015/P00151980.pdf

15 Source: Discussion paper: Comparative labour statistics labour force survey: first round pilot September 2000, Statistics South Africa, 26 June 2001. Retrieved on 13 February 2008 from www.statssa.gov.za

Figure 4: Human Development Index for different countries, from 1975 to 2005¹⁶



3.1.3.11 Based on the weighted average actuarial density for the USA, the UK, Australia and Canada, but adjusted for the differences in HDIs (weighted by the GDP PPP\$ 2006 World Factbook estimate¹⁷), the theoretical demand for qualified actuaries in South Africa in 2005 exceeded the supply by approximately 9%, i.e.:

$$690 \times (0,1817\% \div 0,1174\%) \div (0,957 \div 0,674) = 752.$$

16 Source: Wikipedia, http://en.wikipedia.org/wiki/List_of_countries_by_Human_Development_Index

17 Source: Population: 2006, World Factbook, www.cia.gov/cia/publications/factbook

According to this model, the supply of and demand for fully qualified actuaries in South Africa seemed to be reasonably well-matched in 2005. However, this model still considers the number of qualified actuaries only: models considering total actuarial resources are explored in section 5.

3.1.4 INSURANCE PENETRATION AND INSURANCE DENSITY

3.1.4.1 A measure of development of an insurance market is the level of ‘insurance penetration’, defined as insurance premium income as a percentage of GDP. Swiss Re (unpublished a) developed the concept of the s-curve, depicting the empirical relationship between economic development (GDP per capita) of a country and the level of development of its insurance market. As income rises, the proportion of income spent on insurance increases. This means that insurance premiums grow faster than the underlying economy.

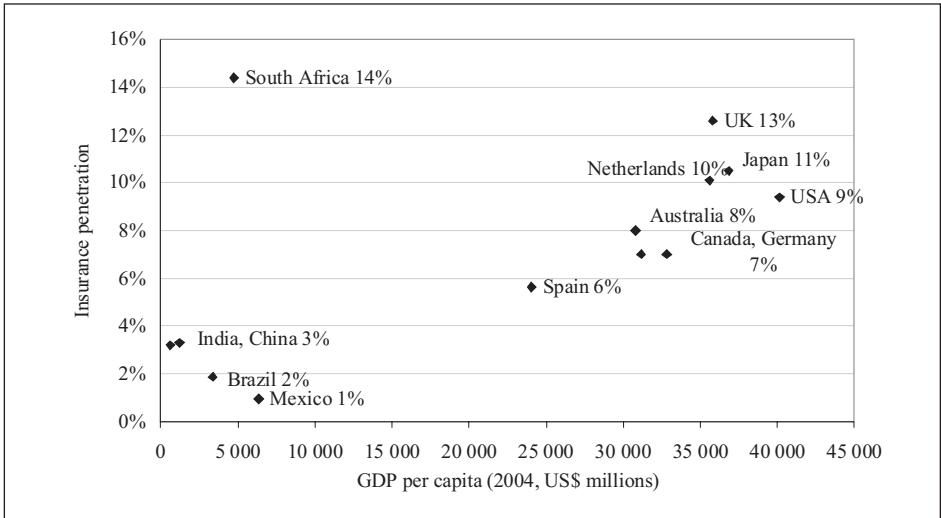
3.1.4.2 Figure 5 shows the relationship between insurance penetration and GDP per capita for a number of countries in 2004. Emerging markets generally fall in the bottom-left corner of the figure, i.e. have both low GDP per capita and low insurance penetration, while industrialised countries are above to the far right. This does not hold true for South Africa, though, which is considered an emerging economy. While South Africa’s GDP per capita is similar to that of other emerging economies, it has high insurance penetration, premiums making up 14% of GDP, compared with 4% for emerging markets, and 9% for industrialised countries (Swiss Re, unpublished a, b). Therefore, while only a relatively small proportion of the South African population participates in the insurance industry, those who do, contribute very high premiums relative to GDP.

3.1.4.3 The ‘insurance density’ of a market is defined as the total insurance premiums divided by the total population of the country. Figure 6 compares insurance penetration and insurance density of different countries in 2004 (Swiss Re, unpublished b). South Africa has a high level of insurance penetration, but the level of insurance density is relatively low. Therefore, while the insurance sector contributes significantly to the size of the economy, only a small portion of the population participates in the sector. However, this applies only to life insurance as non-life insurance penetration in South Africa is lower than that of developed countries (*ibid.*).

3.1.4.4 At present the life-insurance market in South Africa is therefore probably close to being saturated, which supports the conclusion in section 3.1.3 that, in the short term (ignoring financial factors, which are discussed in section 3.2), there is unlikely to be significant demand for new actuaries.

3.1.5 UNEMPLOYMENT AND THE SKILLS MISMATCH

3.1.5.1 Despite recent economic growth in South Africa, there is a significant level of unemployment on the one hand, and a skills shortage on the other. This stems from a mismatch between the supply of and demand for labour in terms of skills, caused by (Roux, 2005; Kibuuka & Van Aardt, 1999):

Figure 5: Insurance penetration vs. GDP per capita¹⁸

- low economic growth—a growth rate of at least 5% a year is needed just to provide jobs for new entrants to the job market;
- high population growth, exacerbated by immigration of unskilled workers;
- the changing structure of the economy from primary-sector-dominated to services-sector-dominated;
- the substitution of labour for capital;
- a poor education system and poor levels of education; and
- emigration of skilled workers.

3.1.5.2 South Africa had an unemployment rate of 23% in September 2007 (26% in 2006), down from 30% in 2002, after a significant increase since 1997. (Statistics South Africa, defines an ‘unemployed’ person as one who unsuccessfully sought work in the month before a survey. ‘Discouraged job-seekers’ are those who desire to work, but who have not been seeking work in the month before.) Allowing for discouraged job-seekers, the rate of unemployment was 35% in 2007 (37% in 2006).

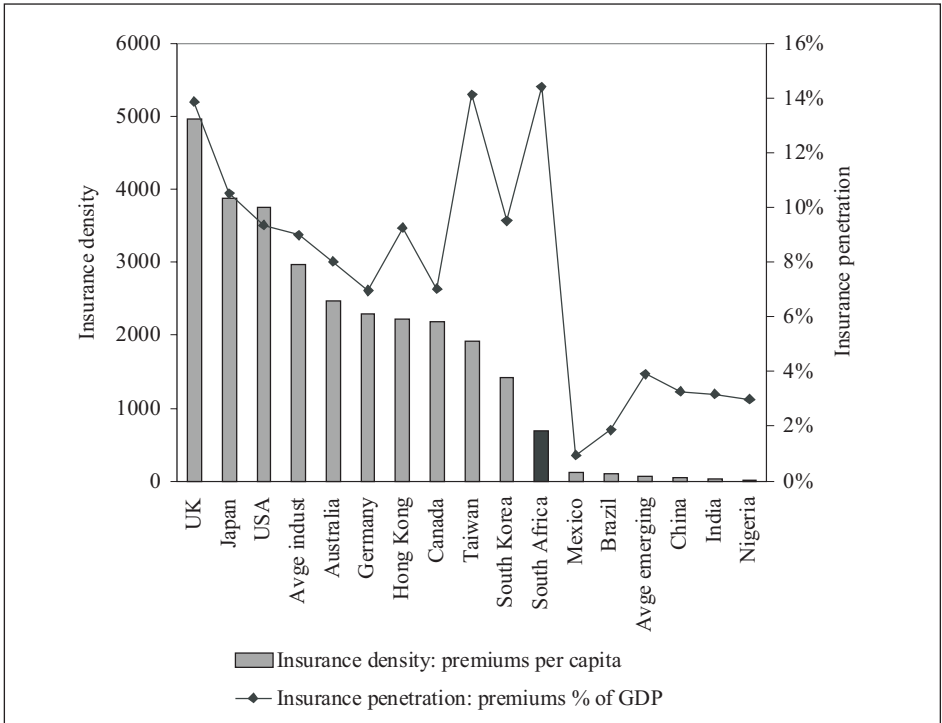
3.1.5.3 Various surveys on skills shortages have been recently conducted:

- The Insurance Sector Education and Training Authority¹⁹ found the most pressing skills shortages were in respect of actuaries, chartered accountants, financial analysts, semi-professional and actuarial support staff, and business and management accountants.

18 Source: Swiss Re (unpublished b)

19 Source: Survey of employment, scarce and critical skills in the insurance sector. Research Focus, Insurance Sector Education and Training Authority, 11 July 2006

Figure 6: Comparison of insurance penetration and insurance density for different countries



- The Johannesburg City Skills Project has set up the ‘2030-Foundation’ which identified the fastest growth sectors in Johannesburg as financial services, information technology and telecommunications, transport and auxiliary and business services. For the purposes of analysing growth in demand, skills were classified into two categories: the ‘super-growth’ category denotes skills for which there is an annual growth requirement of more than 40 per cent, while the ‘high-growth’ category denotes skills with an annual growth requirement of 15 to 40 per cent. ‘Super-growth occupations’ include computer scientists, computer systems analysts, chartered accountants and computer programmers. ‘High-growth occupations’ include (non-CA) accountants, actuaries, engineers (electrical and chemical) and mathematicians. (SACN, unpublished)
- A study by trade union Solidarity revealed a demand for geologists, security specialists, town and regional planners, engineers, agriculture economists, actuaries, risk managers, academics, researchers, veterinarians, doctors and development economists.²⁰

²⁰ Source: ‘Train as artisans’ job experts urge matrics, C Keating, IOL, 20 December 2006. Retrieved on 27 June 2007 from www.iol.co.za

3.1.5.4 The South African Department of Home Affairs has issued a list of 56 occupations for preferential entry into the country. The list includes various kinds of engineers, mathematics and science teachers, scientists, information-technology professionals, actuaries, financial market analysts and risk managers. Entry permits are issued according to a yearly quota. The quotas for actuaries, financial market analysts and risk managers are 500 each.²¹ In the case of actuaries, this is 62% of the number of qualified actuaries at the end of 2007.

3.1.5.5 The high unemployment rate and the skills shortages have the following implications for demand for actuarial resources:

- A negative effect on economic growth and levels of employment affects the size of the insurance market and the demand for actuaries.
- High crime rates discourage foreign investment and encourage emigration of skilled workers, including actuaries.
- Statutory rationing based on race and sex may drive away actuaries of the non-preferred groups to seek employment elsewhere, exacerbating a shortage of supply.

3.1.6 EDUCATION

3.1.6.1 In this section the level and quality of education in South Africa are considered.

3.1.6.2 There is a direct relationship between the level of education and the level of unemployment. In 2006 only 8% of the labour force with a tertiary education was unemployed, compared with 27% and 29% for those with a qualification of grade 12 and less respectively. In that year it was estimated that only 23% of the adult population had grade 12 or equivalent, and only 9% had a higher education.

3.1.6.3 Differences in the skills levels of different population groups pose a significant challenge in reaching equity targets in the workplace. A report by Statistics South Africa²² states that the black African and coloured labour force has the highest percentage of people with no education or with incomplete primary and secondary education.

3.1.6.4 A study entitled ‘The Progress in International Reading Literacy Study’, conducted in 40 countries in 2007, showed that almost 80% of South African pupils in grades 4 and 5 did not reach the lowest international benchmark for reading literacy compared with only 6% in the rest of the countries tested.²³ A national survey of performance showed that of pupils currently in grade 10, 30% did not achieve the required standard in numeracy and 54% did not achieve the required standard in literacy.

21 Source: Specific professional categories and specific occupational classes. GNR.125, Department of Home Affairs, 8 February 2006

22 The South African Labour Market, Selected time-based social and international comparisons. Statistics South Africa, 2002. Retrieved from www.statssa.gov.za

23 Cited in: SA pupils in literacy shocker, News24.com, 2007. Retrieved from: http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-25_2264008

3.1.6.5 Between 1999 and 2004, an average of only 4,4% of matriculants achieved mathematics passes adequate for gaining entry into university to study natural sciences.²⁴ The Human Sciences Research Council stated that only around a third of black matriculants passed mathematics on higher grade and only a fraction of these would study further in the fields of science and technology. South Africa is therefore not producing highly skilled black people in these fields. The education system fails to advance science-based careers (Waller, unpublished). According to a newspaper article:²⁵

“The stark reality of the shortage of blacks skilled in mathematics and its negative effects on tertiary education and the economy is slowly hitting home”.

3.1.6.6 According to the Centre for Development and Enterprise (CDE, unpublished):

“The most effective and most enduring way of resolving the skills crisis would be to dramatically improve the education system”.

3.1.6.7 There are a number of reasons for the poor levels and quality of education in South Africa:

- Socio-economic conditions are poor, as is the level of education of parents. According to the report entitled ‘The Progress in International Reading Literacy Study’, poor literacy was due to the lack of exposure to early-reading activities and less than half of the pupils tested had books at home.²⁶
- The quality of educators is poor. According to Roux (op. cit.), 16% of educators in South Africa are either unqualified or under-qualified. In 1999 only half of the country’s mathematics and science teachers had tertiary qualifications in these subjects.²⁷
- There is a shortage of educators. According to Roux (op. cit.), there is a shortage of between 4000 and 12 000 mathematics and science educators, and between 18 000 and 21 000 teachers quit teaching every year. This is probably due to poor pay and working conditions.
- HIV and AIDS are adversely affecting education. According to Haacker (2004), “In countries afflicted by HIV/AIDS ... the capacity of the education sector is weakened through increased teacher mortality.”

3.1.6.8 If the level and quality of education in South Africa could be improved, it would have a dramatic impact on the size of the economy, and on the socio-economic status of the population (wealth, quality of life and life expectancy). This would result in an increase in the demand for products and services offered by actuarial resources.

24 Source: Education in crisis mode, Fin24, 2008. Retrieved from: http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-25_2264008

25 Catching all young actuaries, D Sowaga, *City Press*, 10 March 2002

26 supra

27 Source: Education in crisis mode, Fin24.com, 2008. Retrieved from: http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-25_2264008

3.1.7 EMIGRATION

3.1.7.1 The growing rate of emigration of skilled workers from South Africa has detrimental effects on the economy and socio-economic conditions in the country. This reduces both the supply of and the demand for actuarial resources.

3.1.7.2 In an environment of global skills shortages, Africa as a whole is experiencing a serious loss of skills. The International Organisation for Migration estimates that since 1990, 20 000 professionals have left Africa every year. According to the United Nations Economic Commission for Africa, African markets find it too difficult to compete in a globalising labour market (Waller, unpublished; see also Piliso, 2007; Van Rooyen, unpublished).

3.1.7.3 Emigration from South Africa accelerated after the country moved to majority rule in 1994. According to a press article²⁸ some 1,4 million South Africans are thought to be living in Britain alone.

3.1.7.4 A London-based recruitment agent specialising in placing actuaries internationally, said there was a huge demand for South African actuaries abroad.

3.1.7.5 Van Rooyen (unpublished) states that for each skilled emigrant, 10 unskilled jobs are lost, and that emigration has cost the country R285 billion in the form of the loss of potential contributions to GDP.

3.1.7.6 According to a press article,²⁹ a survey by the Southern African Migration Project shows that 78% of the companies participating in the survey before 1994 stated that emigration had no effect on the availability of skills, 21% stated that the effect was minimal and 2% stated that it was significant. In a survey in 2001, the figures had changed to 41% (no effect), 26% (minimal) and 33% (significant). Sectors suffering as a result of the emigration of skilled personnel are the computer, high-technology, industrial, banking and financial, education and health sectors.

3.1.7.7 It is mostly whites and Indians that are emigrating, but emigration is not limited to these groups and includes black professionals. According to Waller (op. cit.), “Both the heads of Business Unity SA and the South African Chamber of Business consider the trend extremely worrying and potentially disastrous for the economy.”

3.1.7.8 Among the reasons stated for emigrating were concerns over personal safety and security and affirmative action. Van Rooyen (unpublished) lists violent crime as the reason why 60% of emigrants have left South Africa, where the murder rate is similar to the mortality rate of countries involved in war. Affirmative action is a policy that seeks to address past discrimination through active measures to ensure equal opportunity. According to the CDE (unpublished), “The government’s growing emphasis on employment equity is making the skills market far tighter because the most skilled people—whites—are no longer freely employable.”

3.1.7.9 Other reasons stated for emigrating were:

28 Home sweet home – for some. How can Africa move from brain drain to brain gain? *The Economist*, 11 August 2005

29 Emigration hits companies hard. J. Leuvennink, *Finance 24*, 8 November 2001. Retrieved on 15 January 2008 from www.fin24.co.za/articles/

- negativity about current economic conditions and little expectation of improvement;
- problems associated with HIV and AIDS;
- decline in social conditions including falling educational standards and health care;
- poor upkeep of public amenities;
- the cost of living;
- income levels, including better jobs and attractive remuneration abroad; and
- levels of taxation.

3.2 CHANGES IN THE FINANCIAL ENVIRONMENT

3.2.1 THE FINANCIAL SECTOR CHARTER

In addition to a number of social objectives, the Financial Sector Charter³⁰ aims to improve access to financial services for a larger segment of the population and to improve national savings and investment levels, in order to improve economic growth and individual financial security. As a result, a series of simple, low-cost financial products have been developed, which has provided additional work for pricing and product-development actuaries.

3.2.2 INCREASE IN REGULATORY AND GOVERNANCE REQUIREMENTS

3.2.2.1 The global extent of legislation affecting the role of actuaries (and other professionals such as accountants) has been increasing at an accelerating pace. A corporate survey (PwC, unpublished b) has identified ‘excessive regulation’ as the main concern of insurance companies worldwide, increasing costs and limiting competition.

3.2.2.2 Another corporate survey revealed that South African insurers also find the degree of regulation cumbersome and the “complexity of the regulatory environment is now considered to be the greatest barrier for achieving first rate compliance”. Virtually all participants believed that regulatory pressure on financial institutions would increase over the next three years (PwC, unpublished a).

3.2.2.3 This was reiterated in a survey in South Africa in 2007. Also, a generally more competitive global environment placed a greater burden on companies to find new products, innovate, and keep prices down. (CDE, unpublished).

3.2.2.4 Much of South Africa’s legislation and actuarial guidance notes have been extensively reviewed and expanded in the last few years, giving rise to new requirements for actuaries. Examples of relevant legislation include, *inter alia*, the Long-term Insurance Act (no. 52 of 1998), the Medical Schemes Act (no. 131 of 1998), the Short-term Insurance Act (no. 53 of 1998), the National Credit Act (no. 34 of 2005) and the Collective Investment Schemes Control Act (no. 45 of 2002).

3.2.2.5 One of the purposes of regulation is the protection of all stakeholders in the market against fraud, poor risk management, strategic business failure and poor corporate governance (Sherwood, unpublished). In recent years, incidents of fraud, corporate strategy failures, corporate governance and control failures, and the exposure

30 Retrieved from <http://www.fscharter.co.za/>

of certain established business practices as being unfair, have resulted in changes in legislation and regulatory practices, in an attempt to restore public confidence.

3.2.2.6 The increase in regulatory requirements, while a concern for insurance companies, has increased the demand for actuaries—both for those working in the industry and for those employed by the regulator—either by their involvement in litigation processes and in the development of new regulations and the review of existing regulations, or by the increased need for compliance.

3.2.2.7 Various events and developments in South Africa and elsewhere have created additional work for actuaries. The failure of Fedsure Life Assurance Limited in 1998 has led to additional requirements from actuaries such as a detailed and compulsory analysis of surplus by the statutory actuary, the appointment of external actuaries to execute data and system audits, the development of asset-liability management as an integrated discipline throughout the operational and strategic management and governance of companies, including the separation of shareholder and policyholder funds and appropriate spreading of assets within these funds to prevent over-concentration (Marx & Stander, unpublished).

3.2.2.8 In December 2006 legislation was passed regarding minimum early termination values offered by life offices when retirement annuity policies are made paid-up, or terminated or when their premiums are reduced.

3.2.2.9 Pension-funds surplus legislation was finalised in 2001, creating requirements for actuaries to revisit the calculation of exit benefits for members leaving defined-benefit schemes, and the apportionment of any surplus in each fund at the date of the statutory valuation falling between 7 December 2001 and 6 December 2004 (Baskir, 2006).

3.2.2.10 The taxation of South African life-insurance companies was significantly changed with the introduction of the four-funds basis in 1993 (section 29 of the Income Tax Amendment Act, no. 168 of 1993), replacing the sixth schedule to the Income Tax Act (no. 58 of 1962). Further changes were made regularly thereafter, affecting the work of actuaries.

3.2.2.11 The modelling requirements in respect of embedded investment derivatives (e.g. minimum maturity guarantees and guaranteed annuity options) have increased. These include the development of market-consistent stochastic models to quantify the reserves required to meet the cost of embedded investment derivatives.

3.2.2.12 The Equitable Life Assurance Society was forced to close to new business in 2000 because of financial difficulty relating to the insufficiency of reserves set aside to meet its guarantees. This followed a court case in 1998³¹ regarding its payment of differential final bonuses as between policies with guaranteed annuity rates and those without. A judgement by the House of Lords was made against it.³² These events have resulted in a number of changes in the way that the profession is governed, including

31 Equitable Life Assurance Society (Equitable) v. Hyman, HC 1999 no. 00184

32 Equitable Life Assurance Society v. Hyman [2000] 3 WLR 529

changes to the disciplinary scheme. A system of peer review has furthermore been introduced, as well as a system for the revalidation of practising certificates. A Professional Oversight Board and a Board for Actuarial Standards was established and continuing professional development requirements were enhanced.³³ A further consequence of the events relating to The Equitable was that the traditional Appointed Actuary role was replaced with three distinct roles of Head of Actuarial Function, With-Profits Actuary and Reviewing Actuary, and a requirement that all three roles be subject to independent peer review (Kennedy, 2007). There was also a significant increase in regulatory requirements for pension schemes in the UK. This increased governance has rippled through to South Africa, where greater transparency is now required, and greater focus on the management of with-profits and smoothed-bonus business, all of which has added to the workload of actuaries. (Kingston & Clark, unpublished)

3.2.2.13 The personal pension mis-selling scandal in the UK in the late 1990s created significant employment opportunities for actuaries both in the UK and elsewhere. Mortgage-endowment mis-selling in the UK was a similar event, albeit on a smaller scale.

3.2.2.14 In the USA the Sarbanes-Oxley Act of 2002³⁴ was adopted in response to a number of major corporate and accounting scandals, including Enron, Tyco International, Peregrine Systems and WorldCom, that reduced public trust in accounting and reporting practices. The Act covers, amongst other things, corporate governance, internal control assessment and enhanced financial disclosure. While it applies to accounting firms in their role as auditors of public companies, it also has implications for the workload of actuaries in auditing firms and in the companies being audited.³⁵

3.2.2.15 Towards the end of 2006, significant US bank lending to high-risk borrowers, combined with overvaluation of house prices, resulted in increased foreclosures and liquidity problems. Banks transferred much of the risk to third-party investors by way of securitisation (in the form of mortgage-backed securities and collateralised debt obligations), spreading the impact beyond banking institutions. During 2007 and 2008 this triggered a global financial crisis, stock markets in many countries declining significantly and the outlook for economic growth being adjusted downwards.³⁶ According to a report by the International Monetary Fund (IMF),³⁷ legislation to restructure financial regulation is likely to follow, requiring improved risk identification and management, improved capitalisation of institutions globally and more

33 Submission by the actuarial profession in response to the Morris Review's initial consultation document of June 2004, The Actuarial Profession, 9 September 2004

34 Public Company Accounting Reform and Investor Protection Act, Pub.L. 107-204, 116 Stat. 745, USA, enacted 30 July 2002

35 Source: Wikipedia, 2007, http://en.wikipedia.org/wiki/Sarbanes-Oxley_Act

36 Source: Wikipedia, 2008, http://en.wikipedia.org/wiki/Subprime_mortgage_crisis

37 Lessons of the Financial Crisis for Future Regulation of Financial Institutions and Markets and for Liquidity Management. Prepared by the Monetary and Capital Markets Department, IMF, 2009. Approved by Jaime Caruana, 4 February 2009. Retrieved from <http://www.imf.org/external/np/pp/eng/2009/020409.pdf>

disclosure. The expected changes resulting from this crisis would create further opportunities for actuaries.

3.2.3 GLOBALISATION

3.2.3.1 One source³⁸ defines ‘globalisation’ as:

“the movement of people, goods, capital and ideas due to increased economic integration, which in turn is propelled by increased trade and investment. It is like moving towards living in a borderless world.”

3.2.3.2 Another³⁹ defines it as:

“the process by which the experience of everyday life ... is becoming standardized around the world ... increasing global connectivity, integration and interdependence in the economic, social, technological, cultural, political, and ecological spheres.”

3.2.3.3 Globalisation has resulted in more open markets, events in one part of the world having an effect elsewhere (e.g. corporate failures in the UK or USA resulting in new regulatory requirements in South Africa). The Society of Actuaries (SOA) states in its report on a market-place survey⁴⁰ that two phenomena are apparent:

“First, more and more corporations do business in many global regions. Second, the world’s capital market is so interconnected and interdependent that it behaves almost like a single market entity.”

3.2.3.4 Other effects of globalisation include:

- convergence of insurance and other financial industries;
- increased complexity in the financial-services environment;
- greater probability that financial risk events will materialise;
- reducing diversification benefits from investment in international assets and stronger correlations between prices of different assets, which has led to the development of new products such as credit-based structured products;
- a more competitive environment (a growing proportion of business in a particular country being written by foreign companies or subsidiaries of foreign parents);
- the application of thoughts from one country or region to others;
- increase in demand for highly skilled workers; and
- increased mobility of skills.⁴¹

38 Global Education. Retrieved from: <http://www.globaleducation.edna.edu.au/globaled/go/cache/offonce/pid/178>

39 Encyclopedia Britannica. Retrieved from: <http://www.encyclopedia.com/doc/1B1-365689.html?refid=capsulepage>

40 Market Opportunities Research: Report to the Strategic Planning Committee on Marketplace interviews. SOA, June 2002. Leading Solutions Group

41 Source: CDE Focus, supra

3.2.3.5 Globalisation creates a need for common tools and methodologies. Two areas in which this has already been evident are those of financial reporting (international accounting standards) and in solvency regulation.

3.2.3.6 Since 2004 local companies have been required to comply with International Financial Reporting Standards. These requirements aim to address the need for more relevant information in financial statements and include the move toward fair valuation of financial assets and liabilities, the explicit measurement of the value of embedded options and significant additional disclosures. The new reporting requirements have had a significant effect on companies' financial statements and have produced a substantial additional workload for valuation actuaries. Gutterman (2002) states that "the demands that actuarial reporting of insurance companies present to actuaries are great and growing" and "the actuary's role is enhanced and expanded".

3.2.3.7 The increasingly complex and open global market has also resulted in an increased focus on, and a change in, the approach to risk management. Solvency II is a European Union (EU) project started in 2000 for the purpose of reforming the prudential regulation of insurance across the EU. Its aim is to ensure adequate policyholder protection in all EU member states. It will mandate levels of capital adequacy for insurers and encourage sound risk management in the EU insurance industry. It will result, among other things, in more efficient use of capital (Sherwood, unpublished). In July 2007 the European Community issued a draft Solvency II Directive. Implementation and enforcement is expected to occur around 2012.

3.2.3.8 Solvency II provides for a risk-based approach to the capital to be held by insurers, for market-based valuations of assets and liabilities and for full account to be taken of the cost of options and guarantees. It requires enterprise risk management comprising integrated assessment, control and management of risk across the corporate structure. Actuaries could make a significant contribution towards the development of systems for enterprise risk management.

3.2.3.9 The new risk-based capital requirements and their supervision creates new challenges and opportunities for actuaries. The President of the International Association of Actuaries stated:⁴²

"Actuaries possess significant expertise in analyzing and modeling the financial implications of risks. Actuaries have been in key positions in measuring and assessing the insurance liabilities and the need for solvency capital in an insurance company, but also in identifying means for risk mitigation and the efficient use of risk capital".

3.2.3.10 French (2003) states that, as risk management and risk measurement are gaining increasing importance, company management are turning to their actuarial departments to contribute to the understanding of the key drivers of their businesses and

42 Solvency Management in Life Insurance, H Mannonen. Seminar, International Association of Actuaries, Mexico. April 2007. Retrieved on 15 January 2008 from www.actuaries.org

deliver fact-based answers to strategic questions. Actuaries will, however, need to get closer to the field of financial economics to seize these opportunities.

3.2.3.11 Various commentators agree that the need to develop frameworks of enterprise risk management to optimise capital structures, implement effective controls, improve strategic decision-making and enhance risk-adjusted returns, creates opportunities for actuaries who are able to provide expert advice in risk identification, assessment, measurement and management.⁴³

3.2.4 CHANGES IN THE SOUTH AFRICAN ECONOMIC AND BUSINESS ENVIRONMENT

3.2.4.1 Since around the start of the new millennium, the change to an economic environment dominated by lower levels of inflation has brought new challenges and opportunities for actuaries. These include the development of new-generation products with lower charges and fewer guarantees, strategies to improve efficiencies and reduce operating costs, and the need to set up additional reserves due to the increased likelihood that investment guarantees may bite, as well as the more careful management of policyholders' expectations regarding the rates of investment return that can be realistically expected. Furthermore, the change in the economic environment has highlighted the need for regular financial-condition reports regarding the expected future solvency position of a company under different possible future scenarios.

3.2.4.2 Another significant change in the global insurance environment is the trend for mutual offices to list and become shareholder-owned. Creedon (2007) states that mutual life offices have largely disappeared in UK financial services. This is also the case in South Africa. Apart from the work involved in the demutualisation process itself, shareholder demands for improved return on capital, appropriate reporting of results and the need to balance policyholder and shareholder interests have also created more work and challenges for actuaries.

3.2.4.3 According to French (2003), the dynamics and volatility of the current business environment are placing increasing pressure on the actuarial departments of insurance organisations. There is increasing pressure to improve efficiency and accountability, and to produce lean budgets. The accelerated valuation and reporting timelines and increasingly complex accounting and regulatory requirements place more demands on actuaries' time and resources.

3.2.4.4 Another trend affecting the number of insurance companies, which seems to have the effect of reducing the demand for actuaries, is that of the consolidation of the insurance industry through take-overs and mergers. Often the number of actuarial staff employed by the new company after such an event is in line with the number of such

43 Sources: Global Insurance Industry Outlook. Deloitte, 2006. Retrieved on 9 October 2007 from www.deloitte.com; Gutterman (2002); Presidential address, 2006: Raising our game, N.J. Dumbreck, Institute of Actuaries, 25 September 2006. Retrieved on 3 October 2007 from: http://www.actuaries.org.uk/_data/assets/pdf_file/0006/24495/inst_add_2006.pdf; More actuaries needed. Life Insurance Association of Malaysia. Retrieved on 26 June 2007 from: www.liam.org.my

staff employed by one of the companies before consolidation. In the short term, however, increased rationalisation creates more work for consulting firms with life-insurance practices.⁴⁴

3.2.5 SOCIAL AND DEMOGRAPHIC TRENDS

3.2.5.1 Today, throughout the world, people generally enjoy more freedom and are better informed and aware of their individual rights. With the rise of consumerism, customers are becoming more sophisticated, and no longer accept things in blind faith. Worldwide, fertility rates are declining and life expectancies are increasing (PwC, unpublished a). New risks also emerge, potentially affecting mortality and sickness rates. All these things pose new challenges and opportunities for actuaries; they are discussed in more detail below.

3.2.5.2 Up to the late 1990s with-profit and smoothed-bonus policies on the retail side, and defined-benefit funds on the pensions side dominated the insurance industry. However, since then, the worldwide trend has been a move away from collective ways of organising affairs and risk pooling, to a greater emphasis on individual rights and responsibilities and therefore individual provision. This has led to a decline in the popularity of with-profits savings and final-salary schemes.⁴⁵

3.2.5.3 The need for more cost-effective, flexible and transparent products has led to the redesign of long-term insurance products. In South Africa, universal life products have been replaced by separate risk and savings products. The change in society to one more focused on the individual has made way for unit-linked products, including linked or living annuities, to replace smoothed-bonus and with-profit products. Changes in society have therefore created opportunities for product-development and pricing actuaries.

3.2.5.4 When, from the late 1990s, an increasing number of final-salary pension schemes were replaced by defined-contribution schemes, a profound reduction in demand for actuarial services was predicted.⁴⁶ However, Dumbreck⁴⁷ states that the actual number of actuaries (Institute and Faculty) in the pensions field increased by 80% between 1995 and 2005 (6% a year), well above the most optimistic expectations of an increase of approximately 13% over this period (1% a year). It appears, therefore, that the change has brought new challenges and opportunities for actuaries. According to Mitchell⁴⁸ there is an increasing focus on asset consulting and funds management.

3.2.5.5 Partly resulting from attempts to improve consumer confidence in the insurance industry following corporate failures such as Fedsure and the Equitable Life

44 Source: Presidential address, 1999: The evolving actuary, R.S. Mitchell, Institute of Actuaries of Australia. Retrieved from www.actuaries.asn.au

45 Source: Presidential address, 2004: Restoring confidence in long-term savings, M.A. Pomery, Institute of Actuaries Retrieved from www.actuaries.org.uk

46 Pomery, supra

47 supra

48 supra

and scandals such as poor termination values and the pensions mis-selling saga, and partly due to the change in society away from the ‘paternal ethos’ (Pomery & Brown, unpublished) to greater individualism, greater freedom and greater awareness of individual rights, there is a drive for more consumer education, to communicate more and better with customers and to be more transparent, for example, about charges and the way clients’ funds are managed, about bonuses and about the finances of final-salary pension schemes.⁴⁹

3.2.5.6 The need for greater customer care was bedded down in the ‘treating customers fairly’ (TCF) initiative in the UK, led by the Financial Services Authority (FSA). The TCF initiative aims to raise standards by, for example, improving the information provided to consumers, improving the standards of risk management and transparency for consumers in the life-insurance industry, and improving the quality of complaint handling by firms.⁵⁰

3.2.5.7 In March 2006, in order to help restore customer confidence in the insurance industry, the Association of British Insurers launched a ‘customer impact scheme’. This is a form of self-regulation. It includes the development and promotion of products and services that meet the needs of customers, the provision to customers of clear information and good service when they buy insurance products, the maintenance of an appropriate and effective relationship with customers and the provision of good service after they have bought a product.⁵¹

3.2.5.8 The increased requirements on firms to communicate more, and more appropriately, with customers, creates both opportunities and challenges for actuaries.

3.2.5.9 Since 2002 a new social security system has been under consideration in South Africa. The aim is to address the social problems resulting from the high rate of unemployment and poverty and the high prevalence of HIV and AIDS.⁵² The reform is expected to be operational by 2010. As Mr S. Jehoma has pointed out,⁵³ actuaries have an opportunity to influence the development of appropriate models, to calculate the effects of the changes and to provide advice and assistance in the implementation of the new schemes.

3.2.5.10 In industrialised countries, the ageing of the population is a key demographic trend with significant financial consequences. Low birth rates, which result in a declining active population, and increasing numbers of pensioners with longer life

49 Source: Pomery, *supra*

50 Source: Treating customers fairly: progress and next steps, FSA, July 2004. Retrieved on 23 February 2008 from www.fsa.gov.uk

51 Source: Improving performance in the UK life industry. M. Shaw. Life Offices Association convention, August 2006

52 Source: J Anderson, Social Security and Retirement Reform Seminar, Actuarial Society of South Africa Retirement Matters Committee, Rosebank 7–8 August 2007

53 Presentation to the Actuarial Society of South Africa: Comprehensive Social Security and Reform of Retirement Provisions, 7 August 2007 by S. Jehoma, Department of Social Development, Republic of South Africa

expectancies, have rendered traditional state-funded pay-as-you-go pension systems and defined-benefit social-security schemes unviable. Demographic changes create opportunities for actuaries to develop new products and to manage the resulting risks underlying existing products. According to one reinsurer (Swiss re, unpublished b), reforms are likely to shift pension funding and management to the life-insurance industry. While these changes create additional challenges and opportunities for actuaries working in developed countries, this may be less relevant in South Africa currently.

3.2.5.11 The outbreak of a pandemic is a bad-news event creating opportunities and work for actuaries. According to Hewitt & Woolnough (2006), infectious-disease pandemics have historically been the largest causes of excess human mortality, far exceeding those from wars and other disasters. They state that “while mortality rates have been declining for many decades, the recent SARS (severe acute respiratory syndrome caused by the SARS coronavirus) outbreaks and the still increasing HIV and AIDS pandemic are reminders that epidemics of infectious disease remain as a threat”. The HIV and AIDS pandemic is particularly relevant for actuaries in South Africa, where prevalence is the highest in the world. This has significantly altered the shape of the mortality curve, and also the demographic profile of the population.

3.2.5.12 The uncertainty and risk that pandemics create for life- and health-insurance markets create a need to develop models projecting the spread of disease and possible outcomes, in order to understand the potential effects and assist in determining appropriate levels of capital. AIDS has furthermore caused a significant increase in mortality, which affects insurance profit margins, the size of the low-income market and perhaps the demand for funeral-insurance products.

3.2.5.13 Global warming is expected to give rise to extreme weather conditions such as wind storms, droughts, fires, floods, rising sea levels and water shortages, which affect global insurance markets through increased liability claims, higher and more volatile costs of insurance, increased cost of capital and potential reputation damage. This creates opportunities for actuaries to find innovative solutions for new insurance needs (Durant & Green, 2007).

3.2.5.14 Insured losses from natural catastrophes have been increasing since the 1980s, and reached a record high in 2004 (Connor, 2007). The insured property and business-interruption losses stemmed mainly from hurricanes in the USA and the Caribbean and typhoons in Japan. In addition, the terrorist attack in the USA on 11 September 2001 resulted in a significant amount of additional work for actuaries. Opportunities for actuaries working in the field of property and casualty insurance and reinsurance, included:

- the development of new markets to cover such risks;
- the development of catastrophe models for insurance pricing; and
- increased demand for property casualty insurance and catastrophe reinsurance.

3.2.6 ADVANCES IN SCIENCE AND TECHNOLOGY

3.2.6.1 According to one source:⁵⁴

“The digital and information revolution has changed the way the world learns, communicates, does business and treats illnesses.”

3.2.6.2 According to another source the employment outlook for mathematicians, statisticians and actuaries is directly related to advances in computer applications. The continuing computerisation of the working world is one of the driving forces behind the forecast for employment growth in these occupations. It is expected that these fields will provide more application-driven job opportunities, such as financial software development, than at present.⁵⁵

3.2.6.3 The following are implications of technological developments, including increased access to computers and the improvement of computer ability, and of increases in technological power, including the speed and power of computation and telecommunication:⁵⁶

- enhanced ability to develop more complex products and to develop products in shorter times;
- the creation of different needs and methods to meet them;
- more sophisticated modelling of human behaviour;
- more appropriate reserving, for example for maturity guarantees on unit-linked policies;
- more careful risk management;
- informing investment strategy for defined-benefit funds and, to a lesser extent, for with-profit life funds;
- better integration with banks;
- improved control with less reliance on people;
- easier and faster access to ever-increasing volumes of information and data;
- improved data quality for use in claims and underwriting;
- more sophisticated use of client data, for example data mining;
- major improvements in business processing and customer service;
- better customer relationship management;
- cost savings from efficiency improvements;
- increased speed of delivery; and
- new options for the marketing and delivery of products.

54 Global Education, *supra*

55 British Columbia Occupational Outlooks, 2005. *Work Futures Handbook*, Canada. Retrieved on 29 June 2007 from www.workfutures.bc.ca

56 Sources: Market opportunities research: report to the strategic planning committee on marketplace interviews. Society of Actuaries, June 2002. Leading Solutions Group; PwC (unpublished a); Life Insurers under the microscope: a review of the SA life insurance sector. C. Symeonidis, Global Equity Research, UBS Warburg, July 2001

3.3 EXPANSION OF THE ROLE OF ACTUARIES INTO WIDER FIELDS

3.3.1 INTRODUCTION

3.3.1.1 Actuaries have traditionally worked in the areas of life insurance and pensions. However, over the last 10 to 15 years, actuaries have increasingly become involved in non-traditional fields where opportunities have arisen mainly as a result of the need for better financial risk management. Actuaries today also work in (Slattery, unpublished; Baldwin, 2005):

- health insurance;
- short-term insurance (also referred to as ‘general insurance’ or ‘property and casualty insurance’);
- investments and funds management (e.g. real option analysis);
- banking;
- social policy;
- corporate finance (e.g. the evaluation of alternative development projects and methods of financing them);
- quantitative analysis;
- personal financial planning;
- enterprise risk management, which involves integrated assessment, control and management of risk across the corporate structure; and
- project finance.

3.3.1.2 The following are further potential areas of involvement for actuaries:⁵⁷

- environmental impact evaluations (e.g. estimating the cost to society of a particular event or activity such as the mining of a dangerous substance such as asbestos);
- compensation calculations (e.g. determining an individual’s loss of income following a disability caused by an industrial accident (Slattery, unpublished));
- financial engineering;
- behavioural economics; and
- utilities and resources industries (e.g. advice to electricity companies and gas utilities on their corporate business strategies).⁵⁸

3.3.1.3 Figure 7 shows the proportions of qualified actuaries working in the various fields in South Africa, compared with fellows who are members of the UK and Australian actuarial bodies. While the statistics are at different dates, ratios are unlikely to vary significantly from year to year.

3.3.1.4 In South Africa and the UK, life and pensions are still the main practice areas for actuaries. However, general insurance has overtaken pensions as the second largest practice area in Australia, and is regarded as the growth engine of the profession.⁵⁹

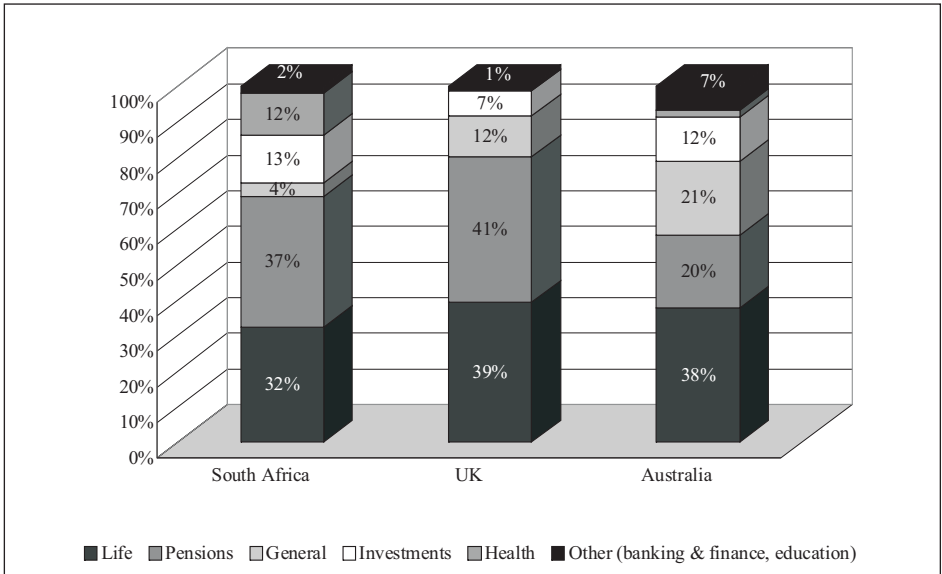
57 Sources: Slattery (op. cit.); Critical review of the U.S. actuarial profession task force, 2006 (CRUSAP). Retrieved on 4 July 2007 from: www.crusap.net

58 Mitchell, *supra*

59 Stevenson, *supra*

A smaller proportion of South African actuaries are involved in general insurance, probably reflecting the lower exposure to natural catastrophe risks, and the fact that South Africa is not a central hub for reinsurance companies as is the case in London.

Figure 7: Split of fellows by practice area in South Africa (2006), the UK (2004) and Australia (2005)⁶⁰



3.3.1.5 A higher proportion of South African actuaries are involved in health insurance, reflecting the lack of an integrated public health system.

3.3.1.6 In the UK, the numbers of actuaries working in the fields of life and pensions each increased by 7% a year from 2000 to 2004, while the number working in general insurance increased by 9% a year (Pomery & Brown, unpublished).

3.3.1.7 Apart from changes in the fields of employment, there has also been a change in the typical roles of actuaries, more actuaries being employed by consulting firms. In the UK, the number of UK fellows employed by consulting firms grew by 6% a year between 2000 and 2004, compared with zero growth in employment by insurance and reinsurance companies.⁶¹

⁶⁰ Sources: Transactions of the International Congress of Actuaries, 2002: National report for the Actuarial Society of South Africa, 2002. Retrieved on 9 November 2007 from: <http://www.actuaries.org/EVENTS/congresses/Cancun/ica2002.htm>; Pomery & Brown (unpublished); Presidential addresss, 2006: The evolution of the profession, M.A. Stevenson, Institute of Actuaries of Australia. Retrieved from www.actuaries.asn.au

⁶¹ Stevenson, supra

3.3.1.8 The main non-traditional fields in which actuaries in South Africa have started to play a role in the last 15 years are discussed below, namely health insurance, general insurance, investments and banking.

3.3.2 HEALTH INSURANCE

3.3.2.1 In South Africa the role of actuaries in the health-benefits field, in particular, has expanded significantly since the early 1990s, driven mainly by the introduction of new legislation. According to Slattery (unpublished), actuaries have improved the quality of advice available to medical schemes, added value in the design and pricing of medical-scheme products and in the identification and management of medical-scheme risk, and contributed to the valuation of post-retirement liabilities, as well as having been involved in the design and pricing of the risk equalisation fund. The design of sustainable and affordable healthcare financing models remains a challenge for actuaries. According to the Actuarial Society of South Africa,⁶² “this makes health care financing one of the most exciting and most contentious of practice areas for actuaries”.

3.3.2.2 Similar issues prevail in the USA, where healthcare issues and medicare reform receive growing attention. These include an increase in regulation of managed healthcare companies, the desire to contain healthcare costs, and the need to evaluate the risks associated with new medical issues, such as genetic testing and the effects of new diseases.

3.3.3 GENERAL INSURANCE

3.3.3.1 In the general-insurance industry in South Africa, actuaries determine the appropriate amounts to be held in reserves to meet future claims, sometimes many years in the future (Slattery, unpublished), as well as setting premium rates.

3.3.3.2 PwC (unpublished a) found that the number of people employed by short-term insurance companies is expected to grow by 21% from 2006 to 2009 (6,6% a year). Also, short-term companies believed that shortages existed for underwriting and actuarial skills. The underwriting shortage “continues to be pronounced and the actuarial skill score has increased since a similar survey conducted in 2004.”

3.3.4 INVESTMENTS

3.3.4.1 Actuaries have traditionally played a role within the fund-management functions of life offices or as investment consultants. Functions include advising on appropriate investment strategies for insurers (and other institutions), taking into account the nature and term of their liabilities.

3.3.4.2 Recently, however, the number of actuaries working for fund-management houses and investment banks in product design and risk management has increased and actuaries are now also involved in the areas of financial risk management, merchant banking and investment banking. Actuaries are involved in asset-liability

62 National report for the Actuarial Society of South Africa, 2002, *supra*

matching and derivative strategies, portfolio optimisation and the field of financial economics, the management of investment managers (including manager selection and performance measurement), the development of products for institutional and retail investors, risk management (including quantitative control techniques) and index construction.⁶³

3.3.4.3 According to Mr R.S. Mitchell, derivatives management will play an increasing part in the future role of the actuary. “Actuaries are risk managers and they should also be expert on the practical side of the operation of futures exchanges, including identifying and quantifying risks arising from the purchasing and holding of derivative contracts.”⁶⁴

3.3.5 BANKING

3.3.5.1 Banking activities in which actuaries are involved include profitability projections of lending products, the pricing of products and services and the design of new products. Mr R.S. Mitchell⁶⁵ states that the banking sector promises new opportunities for actuaries, particularly as banks extend their fund-management activities and take the appearance of life offices.

3.3.5.2 Chamberlain (2007) states that there are various areas within banks where actuaries could be involved given their training, including:

- treasury (i.e. within the investment decision-making process, design of the fund transfer pricing basis and asset-liability matching modelling);
- credit (e.g. as technicians with advanced statistical techniques to design credit-worthiness scorecards and derive probabilities of default); and
- capital (e.g. performing statistical calculations underlying advanced capital bases and modelling the capital impact of management decisions).

3.3.5.3 The requirement for banks (internationally) to adopt a strict regime of risk measurement and more advanced capital assessment under Basel II creates a need for more sophisticated models for measuring risk in order to fulfil use-test requirements, which creates opportunities for actuaries (Chamberlain, 2007). Franklin & Sherris (2007) state that banking risks and the requirements of Basel II will either result in the emergence of a new profession called ‘quantitative risk analysts’ or be taken over by actuaries. Although banks’ major risks (credit risk, operational risks and liquidity risk) differ from those of insurance companies (market risk and insurance risk), and the time scales are significantly less, similar approaches may be applied. The areas of actuarial science and finance are converging and actuaries need to acquire finance knowledge.

63 Sources: Slattery (op. cit.); The actuarial profession strategy review: discussion paper, the UK Actuarial Profession, 2005

64 supra

65 *ibid.*

3.4 OTHER FACTORS INFLUENCING DEMAND

3.4.1 LOCAL EDUCATION SYSTEM

The Actuarial Society has recently embarked on a process of developing a local examination system. The purpose is to produce qualified actuaries in South Africa with knowledge of the South African financial environment. A local education system will require local actuaries to be involved in preparing and maintaining course material, providing tuition, setting and marking examinations, and acting as guinea pigs to sit the examinations and give feedback to examiners, and this will create further demand for actuaries in South Africa.

3.4.2 IMAGE OF THE PROFESSION

3.4.2.1 A negative perception of a profession could have a detrimental effect on the demand for the products and services offered by its members.

3.4.2.2 There is a perception that actuaries are “too narrow, too technical and too weak in ‘business savvy’ competencies”. In order to improve the image of the profession, and therefore increase the demand for actuaries, it is necessary to better equip actuaries with additional skills known to be valued by employers.⁶⁶

3.4.2.3 The UK Actuarial Profession states:⁶⁷ “Customers, as represented by pension trustees and insurance non-executive directors, have a high degree of confidence in actuaries and view them as highly competent, but feel we live to too great an extent in an ‘Ivory Tower’ and need to interface better with the rest of the business community.” They have furthermore found that actuaries have an insufficient understanding of the real world, lack business judgement, have inadequate communication skills, and have a tendency to act as judge and jury. In addition to the need to have much more business understanding and far stronger communication skills, they also need a better ability to work in multi-disciplinary teams.

3.4.2.4 The SOA has found that employers perceive actuaries to demonstrate extraordinary intelligence and analytical thinking skills, perform statistical magic and provide “elegant analyses and solutions to quantitative problems”. However, actuaries are perceived to fail at trying to translate those elegant, sophisticated solutions into either understandable presentations or practical solutions, and generally lack the creative and practical business sense that today’s employers rate equally important to quantitative and risk-management skills. Actuaries also demonstrate a deep understanding of one business discipline—risk management and insurance—but limited knowledge and ability when asked to apply their expertise in broader business disciplines.⁶⁸

3.4.2.5 Lyn, Palandra & Daykin (unpublished) furthermore state: “A full appreciation of the profession does not exist in the business community either.” Actuaries are viewed by many merely as ‘number-crunchers’. They are recognised for their technical

66 Marketing and Market development plan 2006–2008. Society of Actuaries, 2005

67 *supra*

68 Source: Market opportunities research: report to the Strategic Planning Committee on Marketplace Interviews. Society of Actuaries, June 2002. Leading Solutions Group

strengths, but their abilities are viewed by many as narrow in scope. The perception that actuaries cannot provide business solutions stunts the growth of the profession and limits opportunities for actuaries.

3.4.3 COMPETITION AND DEMAND FROM OTHER PROFESSIONS

3.4.3.1 According to the SOA⁶⁹ (2005):

“When actuaries are recognized as one of the pre-eminent professionals in Enterprise Risk Management (ERM), they will serve in large numbers throughout traditional areas of practice and in responsible positions in the broader financial services arena.”

3.4.3.2 Competition from other professions will increase in areas where actuaries can and do provide services. The areas of actuarial science and finance are converging and if actuaries are to seize the opportunities arising from these developments, they need to ensure that their knowledge and skills include the appropriate finance knowledge. Two examples are the areas of enterprise risk management and insurance securitisation. Competition will come from other professions such as financial risk managers, financial engineers, chartered financial analysts and statisticians.⁷⁰

3.4.3.3 On the other hand, actuarial skills may become useful in traditional financial fields, particularly with regard to the estimation of risk and the financial premiums required to justify risk, e.g. in the sub-prime market and in the markets for some of the derivatives developed in recent years.

3.4.4 DEMAND FROM INTERNATIONAL MARKETS

3.4.4.1 According to the South African Department of Labour:⁷¹

“International demand for key professionals is placing greater pressure on the local labour market. Thus, local employers are competing with both domestic and international employers for skilled labour.”

3.4.4.2 The huge increase in demand worldwide, especially from developing markets such as China and India, is also creating opportunities for South African actuaries. It is expected that China and India’s large economies and population sizes and rapid industrialisation and globalisation will result in significant development of the insurance markets. In addition, “liberalisation and deregulation are rendering these de-monopolised markets more accessible and attractive to foreign insurers” (Swiss Re, unpublished a). With increasing global connectivity of markets, actuarial resources are also becoming more mobile. Ms L. Traverso states:⁷²

69 Report of the SOA Board of Governors’ Enterprise Risk Management (ERM) Strategy Task Force, SOA, 2005

70 Source: CRUSAP, *supra*

71 State of skills in South Africa, 2003. Retrieved on 27 June 2007 from www.labour.gov.za

72 Traverso, *supra*

“Since the opening of the Insurance market in India to private sector participation in 1999, and the passing of the Insurance Regulatory and Development Authority Act, 1999, there has been a rapid change in the size and structure of the insurance market – not least among these changes is the sudden and accelerated demand for Actuarial expertise.”

3.4.4.3 In recent years many insurance companies in South Africa have expanded their financial services and life-insurance operations to other African countries and India. International reinsurance companies have also set up their African regional offices in South Africa. While the work is being done by South African actuarial resources, the markets using their services have thus effectively been expanded.

4. RESEARCH AMONG ACTUARIAL EMPLOYERS IN SOUTH AFRICA

4.1 SURVEY METHOD

4.1.1 The actuarial employment market in South Africa has changed significantly in the last few years. An analysis was done of members of the UK Actuarial Profession with employer addresses in South Africa, in 1996 compared with 2007. It became apparent that there was a significantly wider range of employers in 2007 than in 1996, and the actuarial employment market was significantly less concentrated in a few large companies.

4.1.2 In 1996, 32 companies were identified, 8 of which employed 20 or more actuarial resources. In 2007, the number of companies increased to 107, of which 10 employed 20 or more actuarial resources. (In both years, around a third of members with South African addresses chose to have their residential addresses rather than employer addresses in the membership handbook.) The companies employing 20 or more actuarial resources in 1996 employed 55% of total actuarial resources in South Africa (including those whose employer is unknown); in 2007 this reduced to 32%. A large number of employers in 2007, which did not exist in 1996, are small consultancies and asset management companies, employing only a handful of actuarial staff each.

4.1.3 In 1996 the market was dominated by a small number of large companies. As a result of consolidation, many large employers (such as Southern Life Association, Fedlife, Sage Life and Norwich Life) have disappeared and employment of actuarial resources by the companies that took them over did not show corresponding increases. In 2007 a larger number of actuaries worked for asset managers, short-term insurance companies and small consultancies than in 1996. The number of actuaries employed in these fields per company is small, though.

4.1.4 A questionnaire was sent to a number of employers of actuarial resources in South Africa during October 2007 in order to establish:

- historical actuarial employment growth in different fields;
- changes in the demographics of employed actuarial resources over recent years; and
- what employers’ expectations were regarding their future demand for actuarial resources.

The results of the survey are summarised below.

4.2 DEMOGRAPHICS

4.2.1 Nine companies responded, employing almost 40% of actuarial resources in South Africa. The respondents consisted of five large life-insurance companies, a re-insurer and three consulting firms. About 88% of actuarial resources covered in the study were employed by life-insurance companies. The results are therefore more typical of large, long-term insurance companies and not likely to be representative of the actuarial employment market as a whole.

4.2.2 Actuarial resources employed by the respondents consisted of 56% students and 44% qualified actuaries. However, the split between students and qualified actuaries differed significantly amongst respondents. Differences were consistent over years. For example, where a company tended to have a significantly higher proportion of qualified actuaries than students, this was consistent over several years, which indicates that a high proportion of qualified actuaries relative to students cannot be solely attributed to successful pass rates in more recent years.

4.2.3 The numbers of qualified actuaries employed and of students employed both increased by an average of 9% a year from 2002 to 2007.

4.2.4 A higher proportion of employed students are female (30%) than the proportion of qualified actuaries that are female (17%).

4.2.5 The split of students and qualified actuaries between different racial groups, and the change in that split over the last ten years, is shown in Table 2. A detailed split into these separate racial groups was available for 81% of total students employed by all respondents. Only these are included in the table. Among students, representation by black persons (black African, Indian and coloured) has changed from 6% in 1997 to 44% in 2007. Currently only 7% of qualified actuaries are black. Overall (for students and qualified actuaries combined), 26% of actuarial resources currently employed by the respondents are black compared with 5% ten years ago. This compares with a racial split of the general population of 79% black African, 9% coloured, 3% Indian and 10% white.

Table 2: Proportional split of actuarial resources between racial groups

	Black African	Coloured	Indian	White
Students				
1997	1,1%	0,0%	4,6%	94,3%
2007	19,4%	2,6%	22,3%	55,7%
Qualified Actuaries				
1997	0,0%	0,0%	0,0%	100,0%
2007	2,0%	1,0%	4,4%	92,6%

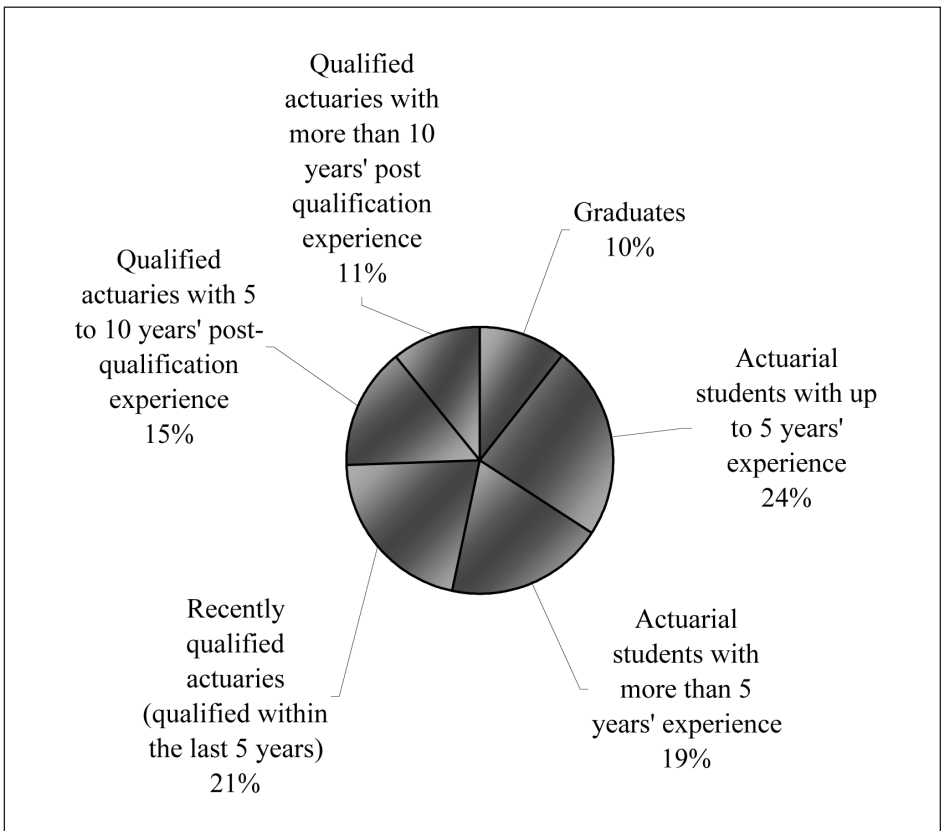
4.2.6 The split of students and qualified actuaries covered by the employer survey between practice areas was as shown in Table 3.

Table 3: Split of students and qualified actuaries between practice areas

	Life	Pensions	Short-term insurance	Health	Investments
Students	69%	23%	1%	2%	4%
Qualified actuaries	65%	18%	1%	3%	12%
Total	67%	21%	1%	3%	8%

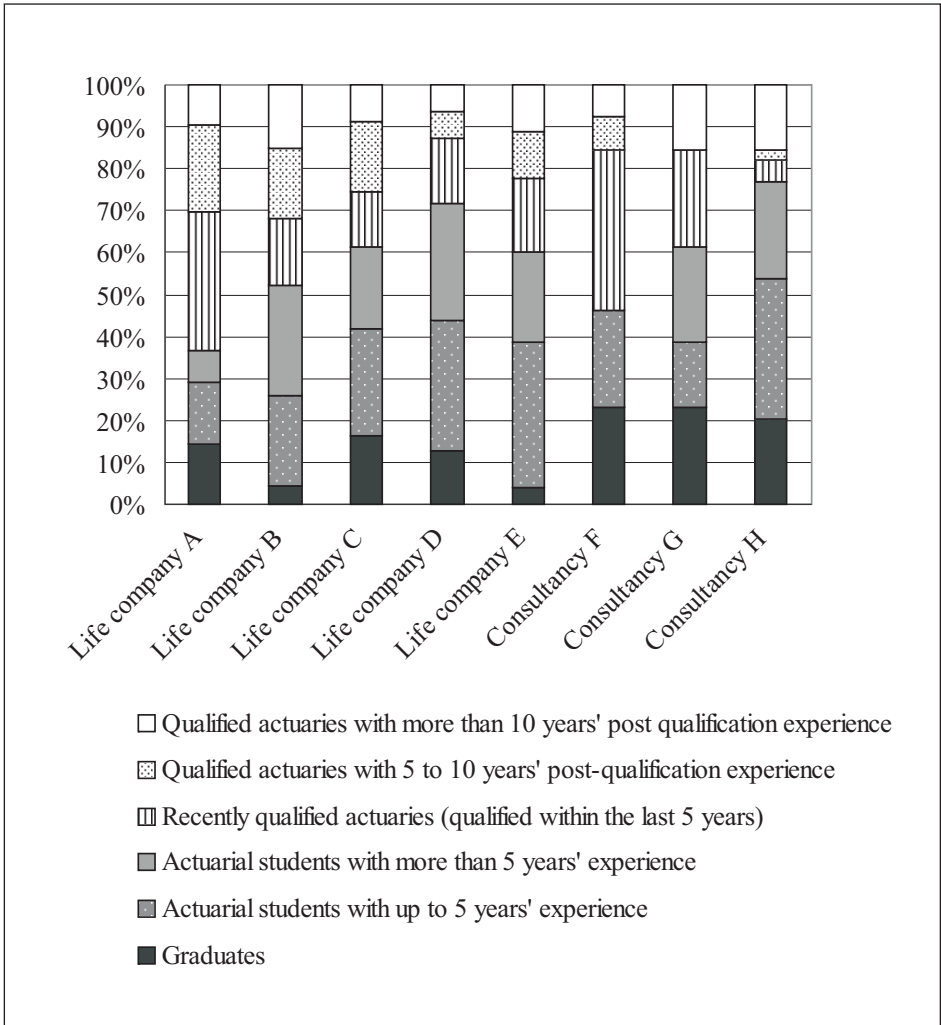
4.2.7 The split of actuarial resources between different experience levels is shown in Figure 8. The biggest employed group is actuarial students with one to five years of experience (24%), followed by recently qualified actuaries (21%) and actuarial students with more than five years of experience (19%).

Figure 8: Split of actuarial resources between experience levels



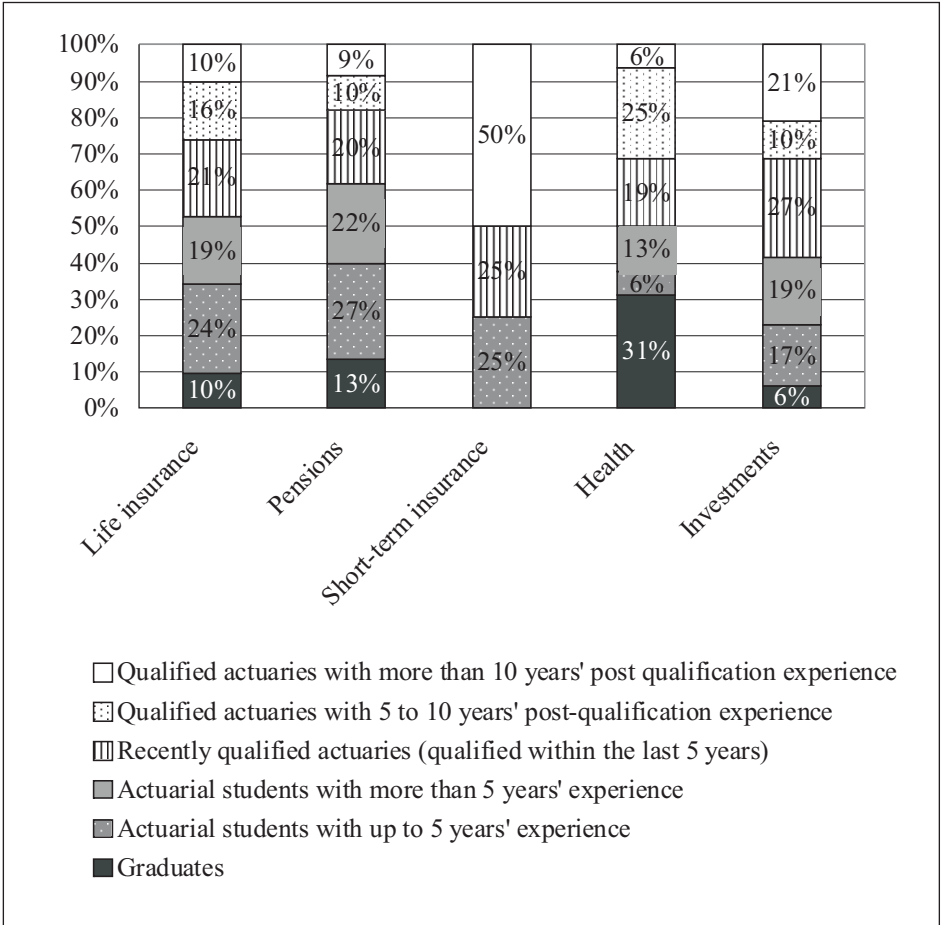
4.2.8 Figure 9 shows how employment of actuarial resources varied between respondents with different experience levels. The split between qualified actuaries compared with students varied significantly between the companies. This was the case both for life-insurance companies and for consultancies.

Figure 9: Split of actuarial resources between experience levels: comparison of respondents



4.2.9 Figure 10 shows the split between experience levels by practice area.

Figure 10: Split of actuarial resources between experience levels by practice area



4.2.10 From the demographic analysis it is evident that the split of employment between students and qualified actuaries is slightly biased towards students for both life (in which 57% are students) and pensions (in which 61% are students). Employment in pensions has shown a decreasing trend in terms of the proportion of total employment over the last five years, from 29% to 21%. (Note, however, that the sample is biased towards life-insurance companies.) Employment in life insurance as a percentage of total employment has remained fairly flat at 67% over the five years from 2002 to 2007. There is a trend of increasing employment of both students and qualified actuaries in investments by the big life-insurance companies. Employment in investments as a percentage of total actuarial employment by respondents has increased from 3% to 8% over the five years from 2002 to 2007. Employers are more likely to employ qualified

actuaries in investments than students. The average split of actuarial resources employed in investments between students and qualified actuaries is 26% to 74%. The opposite is true of employment in healthcare, where the split of resources between students and qualified actuaries is 75% to 25%. (Note, however, that this is not representative of healthcare employment by non-life insurance companies.) Consultancies, rather than life-insurance companies (with the exception of one respondent) employ actuarial resources in the short-term insurance field. The sample is, however, very small.

4.3 VACANCIES AND REASONS FOR LEAVING EMPLOYMENT

4.3.1 The vacancy rate reported (at or around the end of 2007) was around 10%; in other words, the number of positions to be filled represented around 10% of the total number of actuarial resources employed. While the sample is small, it gives some indication of the shortage. The biggest demand was for graduates, followed by qualified actuaries with five to ten years' post-qualification experience.

4.3.2 Judging from the significant number of advertisements for actuarial jobs during the course of 2008, the current shortage is likely to be even higher.

4.3.3 Of all actuarial resources who left employment during 2006 and 2007, 43% were white, 24% were black African, 21% Indian and 12% coloured. The turnover rate (i.e. the number who left as a percentage of the number employed) is significantly higher for black Africans, coloureds and Indians (at around 25%) than for Whites (7%). Figure 11 shows how the reasons for leaving employment (according to the employers surveyed) differed for actuarial resources of different racial groups.

4.3.4 Overall, emigration was the main reason stated for leaving employment (31% of actuarial resources leaving). This varied according to race: of all white actuarial resources leaving a company, 41% left to emigrate. The main reason for black African, coloured and Indian actuarial resources leaving employment was better remuneration (26% in each case), followed by emigration (26%, 16% and 24% respectively). Of the actuarial resources who left employment to emigrate, 58% were white, 20% were black African 16% were Indian and 6% coloured. 'Other' reasons include 'personal reasons', 'family' and 'full-time study'.

4.3.5 The fact that a large proportion of black African, coloured and Indian actuarial resources leave for better remuneration probably reflects the competition between companies for the limited supply of 'affirmative action' candidates.

4.4 EXPECTATIONS REGARDING FUTURE GROWTH IN DEMAND

4.4.1 Six of the eight employers said they expected overall growth in demand for actuarial resources to be in the region of 5% to 10% a year and two expected growth of less than 5% a year. The expectations for growth in life insurance were the same as for growth overall, probably because employers largely represented the life-insurance industry. Expectations regarding growth in employment in pensions, health insurance, short-term insurance and investments were very diverse and the samples are too small to derive meaningful conclusions.

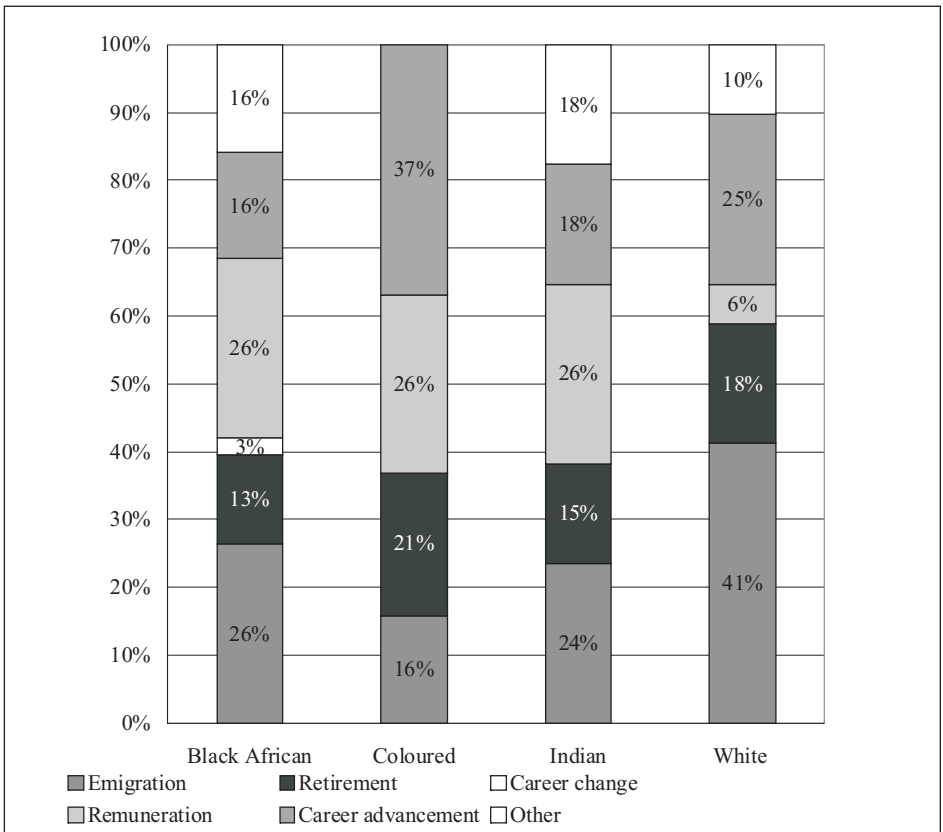
4.4.2 The average expected annual growth weighted by the current number of

actuarial resources employed by respondents is between 3,4% and 8,4% overall, with an average expectation of 5,9%.

4.4.3 It should be noted that the questionnaires were completed at or around the end of 2007. Shortly afterwards, economies worldwide took a downturn, resulting from the global credit crisis. In South Africa, events such as rising inflation, interest-rate hikes, problems at Eskom, xenophobic violence etc. all harmed confidence levels and stability in the economy. Judged from the high number of actuarial job advertisements sent out during the first half of 2008, the turnover rate currently being experienced has increased. It is possible that the supply of actuarial resources dropped as a result of increased levels of emigration and as a result, the excess of demand over supply increased.

4.4.4 Table 4 shows the number of companies by expected growth in demand for different racial groups and Figure 12 shows the ranges of expected growth rates for different racial groups. The demand for black African actuarial resources is expected to

Figure 11: Proportion of actuarial resources leaving employment by reason for leaving: comparison of different racial groups



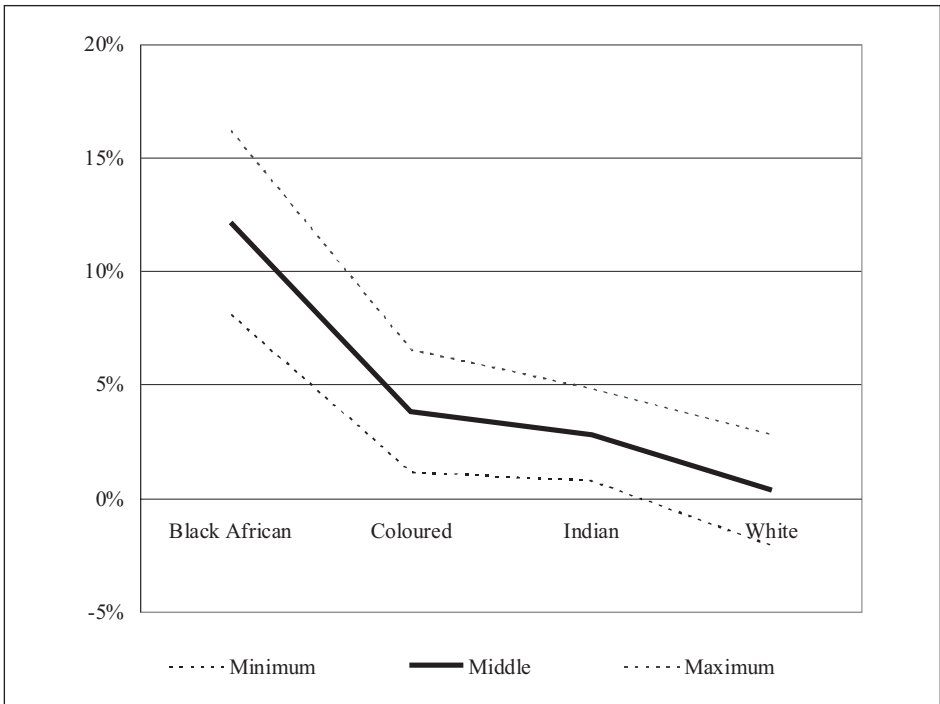
grow much more than for other racial groups. The demand for white actuarial resources is expected to grow the least or to decrease. This is probably driven by employment equity targets and companies’ desire to progress with transformation.

Table 4: Number of companies by expected growth in demand for different racial groups

	Decrease	Increase by less than 5% p.a.	Increase by 5% to 10% p.a.	Increase by more than 10% p.a.	Uncertain
Black African	–	–	2	7	–
Coloured	–	3	2	3	1
Indian	1	1	4	1	2
White	3	3	2	–	1

4.4.5 Table 5 shows how growth expectations differed for male and female actuarial resources. The expected demand for female actuarial resources tends to be

Figure 12: Ranges of expected growth rates for different racial groups



slightly higher than for males, probably also driven by the fact that females count towards employment equity targets in the Financial Sector Charter.

Table 5: Number of companies by expected growth in demand by sex

	Decrease	Increase by less than 5% p.a.	Increase by 5% to 10% p.a.	Increase by more than 10% p.a.	Uncertain
Male	2	3	2	–	2
Female	–	3	3	2	1

4.4.6 Table 6 shows how growth expectations differed for actuarial resources working in different practice areas. Most companies expect growth in demand in life insurance and investments of 5% a year or more. Equal numbers of companies expect a decrease or increase in employment in the pensions area. The views on employment in healthcare are less uniform.

Table 6: Growth in demand for different practice areas

	Decrease	Increase by less than 5% p.a.	Increase by 5 to 10% p.a.	Increase by more than 10% p.a.	Uncertain
Life	–	3	5	1	–
Pensions	3	1	1	1	–
Short-term	–	–	1	2	1
Healthcare	1	1	1	2	–
Investments	–	1	3	1	–

5. MODEL FOR ESTIMATING FUTURE DEMAND FOR ACTUARIAL RESOURCES

5.1 DESCRIPTION OF THE MODEL

5.1.1 It has been assumed that demand relates to:

- real GDP;
- the HDI;
- work volume resulting from changes in the financial environment; and
- demand from and expansion into wider fields.

5.1.2 GDP is a measure of the size of the economy. As the size of the economy increases, the demand for products and services that rely on actuarial expertise increases.

5.1.3 As explained in ¶3.1.3.9, the HDI is a measure of economic and socio-economic conditions in a country. It is an aggregate index combining indicators of

health (life expectancy at birth), wealth (GDP per capita, expressed in purchasing power parity) and knowledge (literacy and education). A positive correlation between these factors and the demand for actuarial resources seems likely. As indicated earlier, current demand for actuarial services in South Africa (in terms of GDP adjusted for HDI) seems to be roughly in line with the weighted average of those of the USA, the UK, Canada and Australia.

5.1.4 An assumption underlying the model is that, ignoring actuarial work environment factors, the number of actuarial resources required in South Africa as a percentage of GDP (in rands at constant 2000 prices), adjusted for HDI, will remain constant. Changes in demand (and in this percentage) may result from changes in the financial environment and socio-economic factors. Growth rates have been calculated for total actuarial resources. It has also been assumed that economic and social conditions (represented by GDP adjusted for HDI), and environmental factors explain total changes in demand in South Africa, and that there are no other factors affecting demand.

5.1.5 In formulaic terms, the rate of growth in demand for actuarial resources in year t is therefore calculated as:

$$d_t = \frac{D_t}{D_{t-1}} - 1 ;$$

where:

$$D_t = D_{t-1} \left(\frac{g_t h_t}{g_{t-1} h_{t-1}} \right) + E_t$$

is the number of actuarial resources demanded in year t and:

g_t is the GDP in year t ;

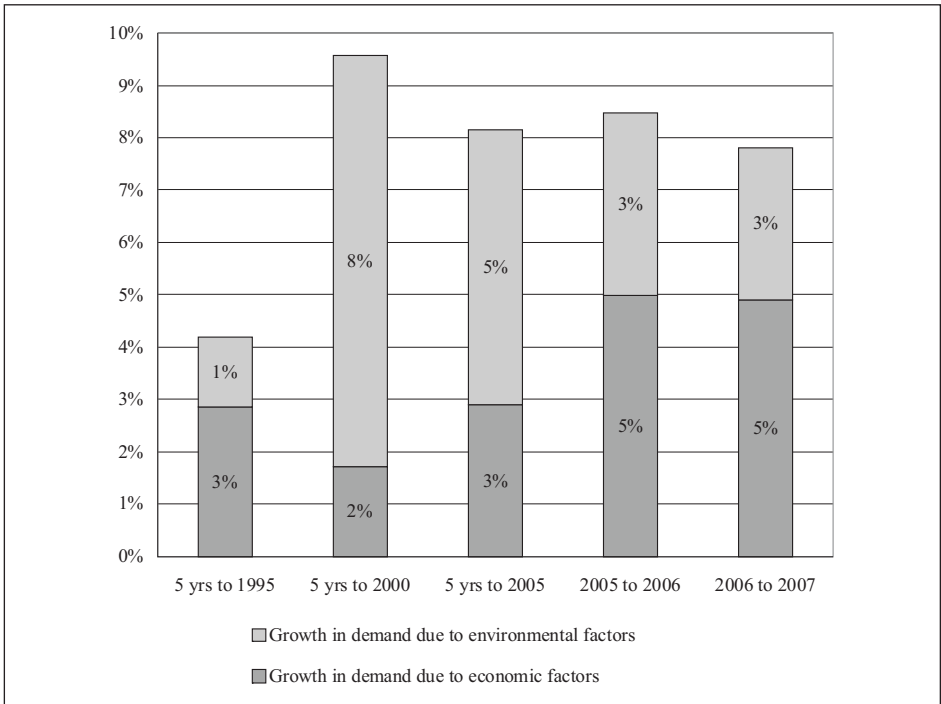
h_t is the HDI in year t ; and

E_t is the number of additional actuarial resources demanded in year t as a result of environmental factors.

5.1.6 Over the last ten years or so, the number of actuarial resources has grown by 9,5% a year (from 713 in 1995 to 2109 in 2007; see Figure 1). Real growth in GDP was approximately 3,6% a year and growth in the HDI was -0,8% a year over the period. The financial services industry grew by approximately 1,4% a year more than the total economy. The balance of 5,3% a year can be ascribed to a combination of additional demands on actuarial resources resulting from the change in environment (e.g. increased regulatory and accounting requirements), increased demand for actuarial services in wider fields, and the expansion of markets into, for example, Africa and India.

5.1.7 Figure 13 illustrates how the annual growth in membership of the Actuarial Society of South Africa (as a proxy for demand) has changed as a result of ‘economic’ factors (comprising the GDP and the HDI) and ‘environmental’ factors (expansion into wider fields etc.). It has been assumed that 15% of these members work outside of South Africa, and that historical supply is a realistic proxy for historical demand with price acting as effective equalisation factor (cf. ¶ 1.3).

Figure 13: Annual growth in actuarial resources working in South Africa explained by economic factors and environmental factors



5.1.8 The data used in these calculations are set out in Table 7. The number of actuarial resources shown excludes the assumed 15% who do not work in South Africa.

5.1.9 For the purposes of Figure 13 the annual rate of growth in demand for actuarial resources due to economic factors from year t to year $t + n$ was calculated as:

$$e_t = \left(\frac{g_t h_t}{g_{t-n} h_{t-n}} \right)^{\frac{1}{n}} - 1.$$

The total annual rate of growth in demand for actuarial resources from year t to year $t + n$ was calculated as:

$$d_t = \left(\frac{D_t}{D_{t-n}} \right)^{\frac{1}{n}} - 1.$$

The annual rate of growth in demand for actuarial resources due to environmental factors from year t to year $t + n$ was calculated as:

$$d_t - e_t$$

Table 7: Data used to explain historical growth in demand for actuarial resources due to economic factors⁷³

Year	GDP (R'million) at constant 2000 prices	HDI	Actuarial demand
<i>t</i>	<i>g_t</i>	<i>h_t</i>	<i>D_t</i>
1990	711 668	0,731	539
1995	803 710	0,745	662
2000	922 148	0,707	1 046
2005	1 115 817	0,674	1 547
2006	1 171 366	0,674	1 678
2007	1 228 763	0,674	1 809

5.1.10 After 2000, as a result of GDP growth, economic factors constituted a higher proportion of the total growth in demand for actuarial resources, despite the reduction in the HDI (from 0,707 in 2000 to 0,674 in 2005). Growth in demand due to other factors was highest during the period from 1996 to 2000, probably reflecting expansion into wider fields, especially health insurance and investments.

5.1.11 Actuarial demand in South Africa as a percentage of $g_t h_t$ was around 0,22% in 2007, increasing from 0,10% in 1995, as can be seen in Figure 14. This ‘adjusted actuarial density’ (cf. section 3.1.3) seems relatively high compared with that for other countries (0,22% for Ireland and Canada, 0,33% for the UK, 0,19% for Australia, 0,13% for the USA, and under 0,5% for Brazil, Mexico and Japan. This is consistent with the high insurance penetration (section 3.1.4), and the fact that the finance sector in South Africa is well developed and comparable with that in developed countries.

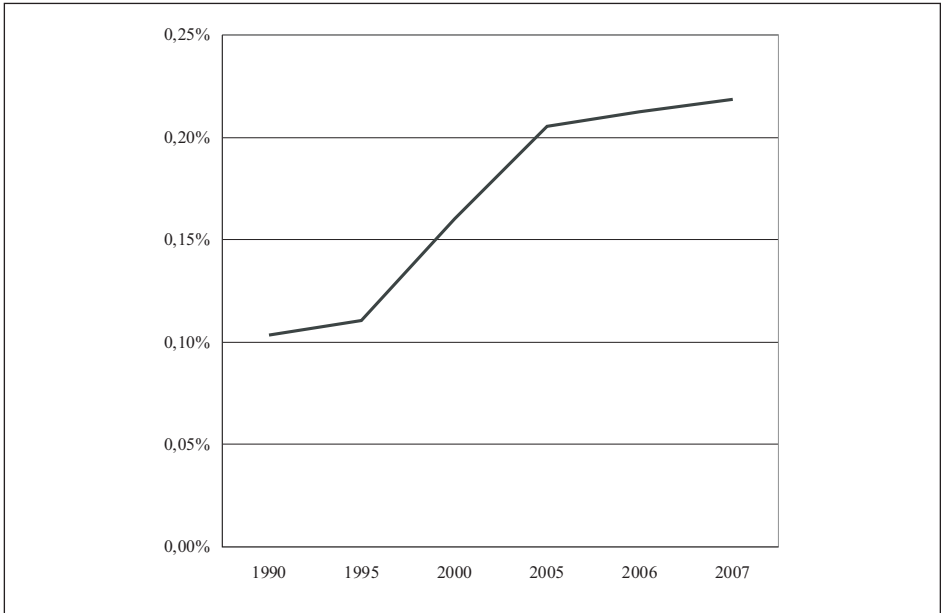
5.2 ASSUMPTIONS REGARDING FUTURE EXPERIENCE

5.2.1 GDP GROWTH

5.2.1.1 With regard to GDP, the 2007 budget projected a positive economic outlook, real economic growth having been projected to average approximately 5% a year over the medium term to 2010.⁷⁴ The forecast for economic growth for 2008 was revised downwards from 4,5% to 4% following a revision on the basis of the problems with energy supply and the downturn in the global economy. In his 2008 budget speech, the Minister of Finance stated that while the South African economy had grown at an average rate of 5,1% over the previous four years, future GDP growth was expected to average 4,3% a year over the medium term. Expected growth rates for the following few

73 Sources: Statistical release P0302, supra; Wikipedia.

74 Source: Budget Speech 2007 by Minister of Finance Trevor A Manuel, MP. 21 February 2007, South African Reserve Bank. Retrieved from www.info.gov.za/speeches/2007/07022115261001.htm

Figure 14: Actuarial demand in South Africa % of g,h_t 

years were 4% for 2008, 4,2% for 2009 and 4,6% for 2010. These estimates were used for a 'base-case' scenario. It was furthermore assumed that the economy will grow at an average rate of 5% a year from 2010 to 2020. (As the employer survey underlying total demand growth assumptions was done around the end of 2007, economic growth expectations prevalent at that time were used.)

5.2.1.2 Under a 'low-growth' scenario, it has been assumed that the skills crisis worsens (e.g. as a result of increased emigration), that the effect of infrastructure shortages is worse than expected, that foreign investment declines etc. The Minister of Finance listed these as some of the binding constraints on faster growth.⁷⁵ GDP growth of 4% was assumed for 2008, declining to 3,5% and 3% respectively for 2009 and 2010 and to 2% a year thereafter.

5.2.1.3 Under a 'high-growth' scenario, it has been assumed that the government succeeds in attracting and retaining skilled workers, education improves substantially in the next few years and foreign investors flock to South Africa. Under this scenario, it was assumed that the economy will grow at 4% in 2008, 5% in 2009, 6% in 2010 and 7% a year thereafter.

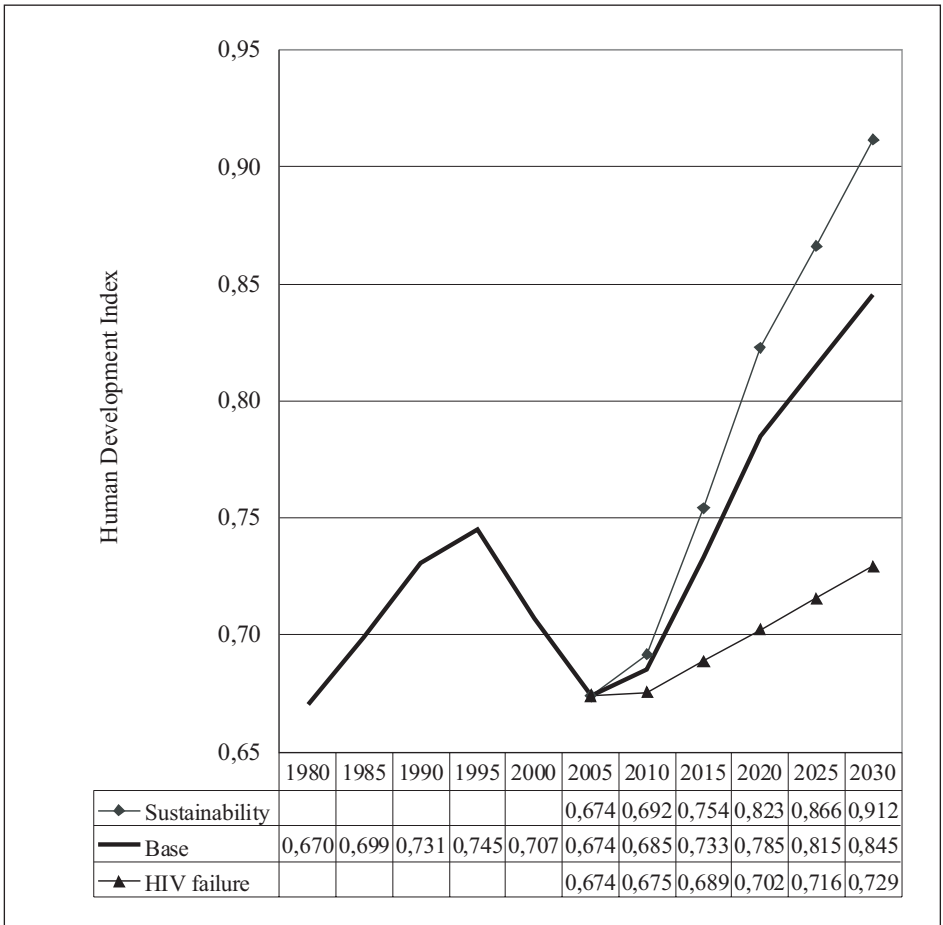
75 Source: Fin24, 2008, Manuel confident of 4% growth. Retrieved from: http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-25_2291173

5.2.2 CHANGE IN HDI

5.2.2.1 Hughes (unpublished) has developed a model that produces forecasts for the HDI based on future values for the underlying components of the HDI. Forecasts were made for a base-case scenario, as well as for pessimistic and optimistic scenarios. The pessimistic scenario was based on failure to control HIV and AIDS, while the optimistic scenario ('sustainable development') assumed increased emphasis on health and education and positive connections to the world economy.

5.2.2.2 Figure 15 shows the actual HDI for South Africa since 1980, as well as projected HDIs under the three scenarios: base, 'sustainability' (referred to as 'high growth'), and 'HIV failure' (referred to as 'low growth'). It was assumed that the trends forecast by Hughes (op. cit.) for sub-Saharan Africa HDI apply to the South African HDI.

Figure 15: Actual and projected HDI for South Africa under three scenarios



5.2.2.3 Under the base case, the HDI is expected to improve from 0,674 in 2005 to 0,845 in 2030, while the improvement is expected to be to 0,729 under HIV failure. Under sustainability the HDI is projected to improve to 0,912, closer to current HDIs of developed countries.

5.2.3 CHANGE IN ACTUARIAL WORK ENVIRONMENT

5.2.3.1 Growth in demand for actuarial resources resulting from changes to regulations, capital and solvency requirements, accounting standards, consumerism, technology etc. is the most difficult to predict. For these factors the past is not necessarily a good predictor of the future. At best, certain trends could be extrapolated, although it is not always clear what would be an appropriate period of extrapolation. This assumption is therefore quite subjective.

5.2.3.2 The survey of South African actuarial employers has shown that employers expect an average growth in demand of between 3,4% a year (on a low-growth scenario) and 8,4% a year (on a high-growth scenario), with an average, or base-case scenario of 5,9% a year. It has been assumed that this expectation reflects total demand growth, including both that resulting from economic factors and that resulting from environmental factors. These expectations indicate expected growth in demand resulting from other environment factors to be between -0,6% a year and 3,9% a year (derived as total expected growth as per the employer survey, less projected changes in GDP and HDI as per sections 5.2.1 and 5.2.2).

5.2.3.3 For the purposes of projecting future demand for actuarial resources, it has been assumed that growth in demand resulting from environmental changes will be 0% initially under the low-growth scenario, reducing by 0,05% a year throughout projection period; 2% a year throughout under the base-case scenario; and 4% initially under the high-growth scenario, increasing by 0,05% a year.

5.3 PROJECTED ACTUARIAL DEMAND

5.3.1 Under the base-case scenario, overall demand for actuarial resources in South Africa is expected to grow at 6,3% a year initially, increasing to 8,4% a year after three years. Expected growth is 4% a year under the low-growth scenario, reducing to 2,0% by 2015 and 8,5% a year under the high-growth scenario, increasing to 11,3% by 2015. In terms of absolute numbers, projected demand for actuarial resources under the three scenarios is shown in Figure 16.

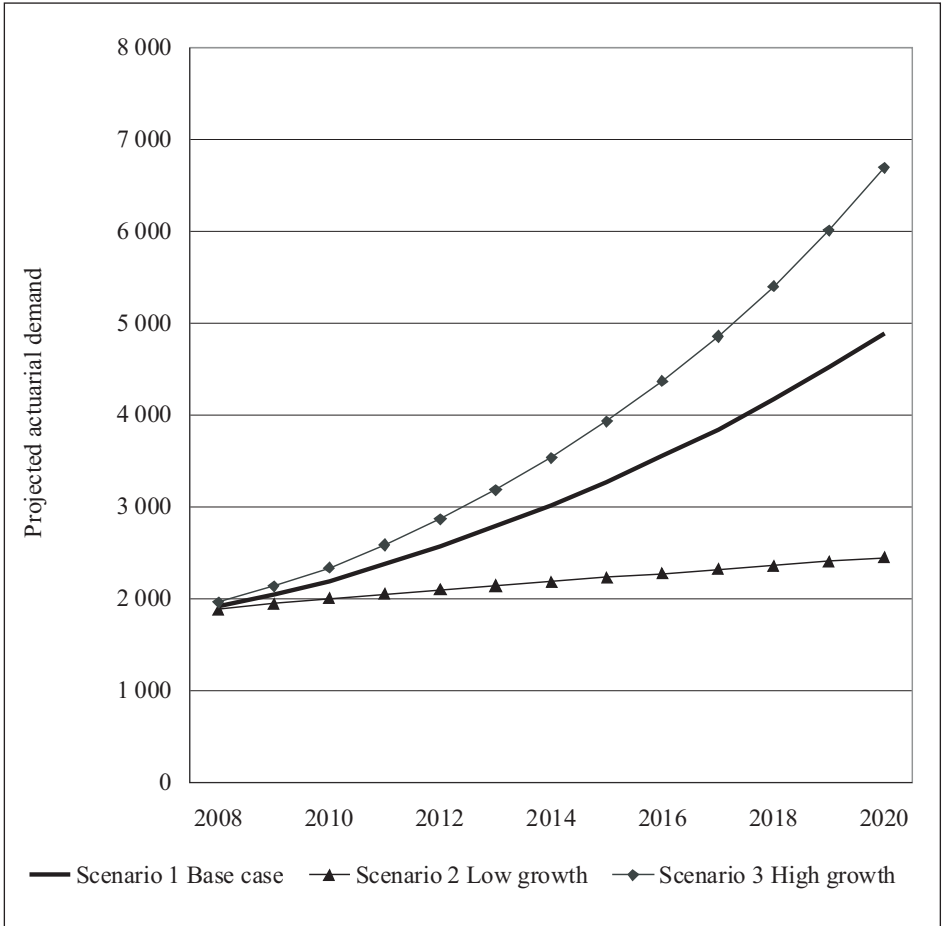
5.3.2 It is projected that there will be demand for between 2005 and 2332 actuarial resources in 2010, growing to between just over 2200 and almost 4000 in 2015.

5.3.3 Under these scenarios, the 'adjusted actuarial density' (number of actuarial resources as a percentage of g, h_t), is projected to increase to 0,253% by 2015 and to 0,277% by 2020. These numbers are high relative to that in the USA but below those in the UK.

5.3.4 It should, however, be noted that expected demand for actuarial resources growth represents largely the expectations of employers of actuarial resources in the life-insurance field. Given that other countries have recently experienced rapid

growth in employment of actuarial resources in short-term insurance, expected overall growth figures are likely to be understated. Also, further growth may result in new wider fields and more expansion into exploratory markets.

Figure 16: Projected demand for actuarial resources in South Africa under three scenarios



6. CONCLUSION

6.1 South Africa has a well developed and globally competitive financial sector, which has grown significantly over the last few decades. This has resulted in high growth in demand for actuarial resources. As a result, the actuarial density of South Africa is comparable with that of developed countries. However, this sector serves a relatively

small portion of the population—the educated and relatively wealthy. There is substantial room for improving the quality and level of education of the population, which will positively affect economic growth and reduce socio-economic problems via a reduction in unemployment, alleviation of the skills crisis, a reduction in income inequality and improvement of the wealth of the population as a whole. These effects should, in turn, result in reduced crime levels and lower levels of emigration of skilled workers. All of this will positively affect economic growth and demand for actuarial services. The annual rate of growth in the demand for actuarial resources resulting from economic growth and improvement of socio-economic conditions is expected to be about 4% a year initially, increasing to about 6,5% a year in the next five years.

6.2 In the short term, it is expected that a higher demand will result from changes in international accounting standards and capital quantification requirements. Actuarial resources will continue to move into wider fields such as investments and general insurance, and expand markets into Africa and India. In addition, the development of a local education system will add further demand on actuaries to prepare material, and set and mark examinations. Demand resulting from the change in the environment and the continued expansion of actuaries' role into wider fields is expected to grow by between –0,1% and 4,1% a year (an average of 2,0% a year) in the next five years.

6.3 Overall, demand for actuarial resources is expected to grow by between 3% and 10% a year, with an average expectation of just over 7% a year. This results in a demand for around 2600 actuarial resources in 2012, compared with just over 1800 at the end of 2007 (working in South Africa).

6.4 The demography of actuarial resources in South Africa, in terms of both race and sex, is not representative of that of the overall population. The proportion of qualified actuaries who are black African (2%) is significantly below that of the general population (79%), and while there is evidence that this is being addressed in the proportion of students who are black African (19%), there is still a huge gap. As a result, there is currently a significant demand for black African actuarial resources, especially qualified actuaries.

6.5 Given the significant developments in the world economy (resulting from the mortgage crisis in the USA) since this research was done around the end of 2007, it is likely that, in the short term, demand may turn out to be below projected numbers. In the long term, these developments are likely to create further opportunities for actuaries, because of the increased requirements for appropriate risk management.

6.6 Also, growth expectations reflect the views of employers in the life-insurance field. It is likely that higher overall growth will result from greater involvement of actuarial resources in the short-term insurance field, investments, banking etc.

6.7 Suggested areas for further research include the factors driving demand for actuarial resources in wider fields in South Africa such as general insurance, investments and banking. This may include actions that can be taken by actuaries to make employers more aware of how actuarial skills can be utilised in these fields. In countries such as the UK and Australia, growth in employment in these areas has been significantly higher than in the traditional fields of life insurance and pensions. Given that this paper is more representative of demand for actuarial resources in the field of life insurance, future demand for actuarial resources is likely to be understated.

6.8 To complement this study on demand, research also needs to be completed into the supply of actuarial resources.

6.9 In addition, further research could also be done into the reasons for different actuarial densities in different countries. An understanding of the factors driving these could help to refine the model of the demand for actuarial resources.

6.10 Further research could also be done into how actuaries could contribute to the improvement of South Africa's HDI, for example using their skills in health benefits and AIDS modelling.

6.11 Finally, a study of how actuarial salaries in South Africa compare with salary levels elsewhere, currently as well as historically, and also in relation to the general cost of living, may be a useful complement to the study of the demand for and supply of actuarial resources.

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