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INTERNATIONAL FINANCIAL SERVICES:

ISSUES IN RISK AND INSURANCE

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CERTIFICATION

I hereby declare that the submission is my own work and that, to the best of my knowledge and belief, contains no material previously published or written by another person nor material to which a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement is made in the text.

Timothy Wee

2004

ABSTRACT

This thesis is a pioneer study in the area of international financial services. Several issues in risk and insurance that have not been addressed in existing literature are studied and are represented by three broad objectives. Firstly, this thesis seeks to establish what drives the demand for life insurance using a sample of Organization for Economic Co-operation and Development (OECD) countries. Methodological improvements are made over previous studies including the use of the Generalized Method of Moments (GMM) to account for inherent weaknesses in the data such as measurement errors and endogeneity that have not been properly accounted for in the past. The results both extend and reconcile the literature on life and non-life insurance demand and finds that the factors explaining the demand for non-life insurance also affect that of life insurance. Secondly, the determinants that influence the level of foreign participation are investigated with the aim of 1) providing a more complete picture of total life insurance demand and 2) identifying the factors that attract foreign participation in life insurance markets. This has important implications in view of the greater role international insurance services will play as the regulatory walls of global markets continue to fall. The findings show that for life insurance markets, the level of openness and liberalization of the domestic market influences the level of participation of foreign insurers. The underlying level of competition in the life insurance market on the other hand influences domestic insurers. In addition, this thesis finds that other variables such as income, social security, financial development, and human capital accumulation reflect a larger insurance opportunity; as such, they impact on both foreign and domestic participation levels in the same way. Finally, this thesis seeks to highlight the importance of foreign exchange exposure within the U.S. insurance industry and investigates the presence of size, operational scope and time-horizon effects on the hedging choices of U.S. insurers. Using an improved methodology, the presence of foreign exchange exposure in the U.S. insurance industry is identified. The results also confirm the presence of operational scope and time-horizon effects in the hedging strategies of U.S. insurers.

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

CHAPTER 2

DEMAND FOR LIFE INSURANCE IN OECD COUNTRIES

CHAPTER 3

FOREIGN PARTICIPATION IN LIFE INSURANCE MARKETS

CHAPTER 4

FOREIGN EXCHANGE EXPOSURE: EVIDENCE FROM THE U.S. INSURANCE INDUSTRY

CHAPTER 5

CONCLSSIONS AND FURTHER RESEARCH

LIST OF TABLES

APPENDICES

LIST OF ACRONYMS

AIC	Akaike Information Criterion
ADF	Augmented Dickey-Fuller
ASEAN	Association of Southeast Asian Nations
BLUE	Best Linear Unbiased Estimate
EU	European Union
FDI	Foreign Direct Investment
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
GATS	General Agreement on Trade and Services
GER	UNESCO's Gross Enrolment Ratio
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IBC	International Business Climate
IIT	Intra-Industry Trade
M&A	Mergers and Acquisitions
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States of America
USD	United States Dollar
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

This thesis is about financial risk. It is also about globalization and the growing importance of trade in financial services. As an important contributor to international trade in financial services, insurance, in its simplest form, represents the management and pricing of financial risk arising from the pooling of insurance contracts. This allows for greater risk taking by firms and individuals, which in turn creates more demand for trade in goods and services, leading to greater economic development.

Over the last two decades, the global economy has witnessed the continued and steady increase in the globalization, deregulation and proliferation of international trade in financial services. Indeed, the emergence of trading pacts like the Organization for Economic Co-operation and Development (OECD), and the Association of Southeast Asian Nations (ASEAN) and economic zones like the European Union (EU), has only served to highlight the increasing trend toward less restricted trade and the more liberalized movement of both service providers and consumers.

In propagating economic cooperation between countries encouraging increased trade linkages, the General Agreement on Tariffs and Trade was first signed in 1947 with the view to coordinate trade tariffs and provide a system for conflict resolution that would assist the objective of supporting the growth and development of participating countries. Succeeding GATT in 1995 is the World Trade Organization (WTO), established to further the development and acceptance of the multilateral trading system first set up under GATT.

Under the auspices of GATT, one of the key focuses of the Uruguay Round of Trade Negotiations was the furthering of the General Agreement on Trade in Services (GATS) that has paved the way for increased deregulation and the lowering of trade barriers in the financial services sector, including the insurance, securities and banking sectors. Moshirian (2004) outlines some of the more recent advances made under the auspices of GATS with regard to trade in international financial services, and concludes that the new agreements formulated under GATS will continue to pave the way for the emergence of greater multilateral trade in financial products and services as well as the increased consolidation within the financial services industry.

The success of initiatives such as GATS has however resulted in the increased obfuscation between the traditional roles of banks and insurers through trends such as bancassurance. Given these developments and the continued advances made in the opening up of the United States (US), EU, Japan and other less developed countries[1]

[1] Indeed, this has been the case in Asia where the wave of deregulation has resulted in increased foreign penetration rates, particularly in the life insurance sector (Swiss Re, Sigma, 2002, 7, pg 25).

to foreign insurers, the future role played by insurers in the arena of international trade in financial services will undoubtedly be an increasingly significant one.

1.1 International Risk and Insurance

According to Saunders (2000), the primary purpose of insurance is to provide both individuals and firms with protection against potentially adverse events. Such events include death and disability for the case of life and health insurance, as well as destruction of property and workers compensation for non-life insurance. By taking on these risks, insurance companies are in turn compensated via the receipt of premiums from the insured. Essentially, in underwriting these risks to both individuals and firms, insurers play a significant part in economic development via its performance as a financial intermediary and its role in the risk transfer and indemnification process[2].

1.1.1 Role of International Insurance Services

On a broad level, insurance aids economic development via the central role it plays in the financial market. International trade in insurance occurs via cross-border movements in insurance services and the establishment of branches in foreign markets (also known as the international insurance establishment trade). This allows for the global spreading of risks, and increases the risk taking capacity of the

[2]For a more detailed treatise on the role insurance plays in economic development, see Skipper and Klein (2000).

domestic country. Thus, this enables businesses to undertake more innovative (i.e. risky) activities in developing new products and manufacturing processes.

In a speech entitled "The Role of Foreign Insurers in Transition Economies and Developing Countries" given in Geneva in 1995 for the United Nations Conference on Trade and Development (UNCTAD), Skipper (1996) outlines several potential benefits from foreign insurer participation. These include customer service improvements, higher domestic saving rates, transfers of technology and expertise, inflows of financial capital, regulatory improvements, and spillover effects onto the domestic economy. In addition, he argues that the five objections regulators most commonly have are not justifiable from a cost-benefit perspective and in consideration of viable alternatives. Such reservations include the abuse of market power by foreign insurers, the selective marketing of products, failure to contribute to the economy in the long run, strategic reasons and redundancy in services given that domestic insurers already provide adequate services. Furthermore, two additional reasons are cited, including the vulnerability of the domestic economy to greater foreign exchange outflow and the need for regulatory reforms in the insurance industry before the embarkation of liberalization measures. The validity of the former is however not justified given the lack of evidence, while the latter is deemed valid only in regards to certain instances such as prudential and competitive regulation.

1.1.2 Insurance as Financial Intermediation

A major role that insurers play in the economy is that of a financial intermediary. In the larger scheme of things, insurers do not differ from other financial intermediaries including commercial banks. Instead of being called borrowers or savers, the customers of insurers are called the insured, to the same effect. Thus, insurers sell contingent claim contracts that payoff given the occurrence of some event in the future. Insurers also serve to reduce transaction search costs by matching sources of funds with users of funds and in doing so enhance the overall efficiency of the financial system. Skipper and Klein (2000) credits this to insurers playing an essential role in the creation of liquidity and the facilitation of economies of scale in investment by accumulating large amounts of small contributions that are then channeled back into productive economic uses, making redundant the need for individual investments that require the inefficient gathering of information by these individuals.

Thus, insurers play an essential role in reducing asymmetric information in the financial marketplace. Diamond (1984) and Boyd and Prescott (1986) document this reduction in information gathering costs through financial intermediation. With lower information gathering costs, insurance intermediaries, in their role as institutional investors, are also able to perform a monitoring function. In doing so, they help to reduce agency costs between atomistic shareholders and management by improving the productive potential of the projects they fund (Boyd and Prescott (1986) and Conyon and Leech (1994)).

Insurance intermediaries also mobilize savings and channel them toward their most productive uses. This helps create liquidity in the financial marketplace and increases the efficiency of market adjustments, which result in greater financial stability. Pagano (1993) documents such improvements in the efficiency of capital accumulation as the financial intermediary function develops and improves. Greenwood and Jovanovic (1990) and King and Levine (1993) both find that the efficiency of capital allocation is improved through informational economies of scale in financial intermediation. Prior studies also confirm the importance of liquidity in promoting economic growth via ensuring the continued supply of capital toward its most efficient use (Levine and Zervos (1996 and 1998), Arestis and Demetriades (1997) and Skipper and Klein (2000)).

Insurers specialize in risk management via its role in pricing risk, just like any other financial intermediary. The difference here being that in the case of insurers, the types of risks priced differ from other financial intermediaries such as commercial banks. For example, commercial banks underwrite trade performance by pricing credit risk in its provision of commercial letters of credit, whereas insurance companies price different types of risk such as mortality, accident and health.

Like other financial intermediaries, insurers also engage in risk transformation processes that change the character of the risk profile of their customers. Insurance intermediaries are able to specialize in the pricing of risk due to their ability to engage in risk pooling. This pricing of risk by insurers via the pooling together of multiple contracts is really the core of what insurance is and what makes insurance function. In addition, it provides a practical difference between insurance

intermediaries and other financial intermediaries. This is particularly true for life insurance where the duration of contracts sold may be for decades whereas the duration of contracts other financial intermediaries sell may be for much shorter periods of time. Through the law of large numbers, the larger the risk pool, the more predictable the realizations of those risks are.

To that extent, reinsurance plays a vital role in promoting greater insurance capacity through minimizing the fluctuations in the value of these pools, and in ensuring the solvency of insurers in the face of calamitous events. This is because even though pooling reduces uncertainty, unexpected losses still do have the potential to jeopardize the insurer's ability to meet its obligations, much like a bank is vulnerable to losses in confidence. Hence, in addition to reinsurance, regulations require that insurers also hold risk capital to provide a cushion against unexpected losses.

1.1.3 Insurance, Risk Transfer and Indemnification

At the core of the insurance process, insurers generate profit through the pooling of risks. Essentially, insurance companies borrow funds by taking in premiums and offering insurance contracts (contingent claims) that are priced based on the ability of the insurer to pool contracts that are not perfectly correlated, making aggregate losses more predictable.

The role that non-life insurance plays in the economy illustrates how insurance assists in economic development via this mechanism. Through the quantification and mitigation of risks and the corresponding reduction in uncertainty, non-life insurance

encourages trade and investment. It is thus a cornerstone in creating a more conducive environment for businesses to operate in. This is because insurance provides a means for businesses and individuals to transfer business and individual risk to the insurer. By protecting the financial future of both companies and individuals' lifestyles and encourages trade and commerce, insurance allows greater risk-taking activity. Thus, insurance promotes entrepreneurial innovation by taking on some of the risks involved in highly risky new business ventures. These include business investments in property, plant and equipment, which are typically very expensive.

Through the underwriting of risk, insurance provides an important financial service that safeguards the continued growth and stability of the global economy. Lately, the proliferation of different types of insurance products has drastically increased the flexibility of these products in meeting the needs of consumers[3]. Outreville (1996) corroborates this view, and emphasizes the importance of insurance as a key component of a country's financial markets in terms of stimulating productivity and driving economic development.

[3] In recent years, the number of life insurance products has increased from simple whole-life and term insurance to more flexible schemes such as variable life and universal life insurance plans. Under a variable life policy the insured's premium buys a fixed death benefit plus cash value that can be invested in a variety of mutual funds. With a universal life policy, policyholders can increase or decrease the premium of death benefit according to their needs. Furthermore, the interest rate on the cash value component changes with market interest rates.

Given the benefits of insurance, there is however limitations to what it can achieve. According to Fukuyama (1995), the economic benefits that accrue from insurance are likely to depend on the individual characteristics of the country, such as culture and different perceptions and treatment of risk. This is corroborated by Hofstede (1995), who argues that the level of insurance within an economy would depend on national culture and the willingness of individuals to use insurance contracts as a means of dealing with risk. In addition, Ward and Zurbruegg (2000) investigate the relationship between insurance and economic growth and find that the causal relationship between economic development and insurance potentially differs across countries depending on each country's unique cultural and legal environment, regulations, the significance of the country's insurance industry, and other country-specific factors.

1.2 Significance of International Insurance Services

The role of insurance within the world economy is an important one and forms a large component of trade in international financial services. Over the last twenty years, globalization has moved the world inexorably towards a more integrated and liberalized global financial marketplace.

The purpose of this section is to highlight the significance of insurance in terms of trade in international financial services. Table 1.1 outlines the growth of the world insurance industry from 1992 to 2002. As can be clearly seen, total world insurance premiums have grown substantially, increasing 79.2 percent from US$1465.9 million

in 1992 to US$ 2626.9 million in 2002, while premiums in non-life insurance grew from US$ 697.5 million in 1992 to US$1090.8 million in 2002, a rate of about 56.4 percent. In addition, life insurance premiums have grown from US$ 768.4 million to US$ 1536.1 million in 2002, an increase of 99.9 percent. These figures provide a compelling picture as to the growing importance of the international trade in insurance services.

In terms of premium distribution, industrialized countries dominate the global insurance industry. From Table 1.2, it can be seen that North America and Japan and Western Europe alone make up just below 90 percent of global insurance premiums, with the U.S. alone accounting for a 40 percent share of global premiums.

Table 1.1
World Life and Non-Life Insurance Premiums
(1992 - 2002)

Year	*Nonlife*[1]	*Growth(NL)*	*Life*	*Growth(Life)*	*Total*	*Growth(Total)*
1992	697,503		768,436		1,465,939	
1993	792,087	13.56%	1,010,490	31.50%	1,802,731	22.97%
1994	846,600	6.88%	1,121,186	10.95%	1,967,787	9.16%
1995	906,781	7.11%	1,236,627	10.30%	2,143,408	8.92%
1996	909,100	0.26%	1,196,736	-3.23%	2,105,838	-1.75%
1997	896,873	-1.34%	1,231,798	2.93%	2,128,671	1.08%
1998	891,352	-0.62%	1,275,053	3.51%	2,166,405	1.77%
1999	912,749	2.40%	1,424,203	11.70%	2,336,952	7.87%
2000	922,420	1.06%	1,521,253	6.81%	2,443,673	4.57%
2001	969,074	5.06%	1,439,177	-5.40%	2,408,252	-1.45%
2002	1,090,775	12.56%	1,536,122	6.74%	2,626,897	9.08%

Note: Figures are direct premiums written and in nominal USD millions

[1] *Includes accident and health insurance.*

Source: Swiss Re, sigma, various issues, see www.swissre.com

Insurance densities (premiums per capita) and insurance penetration (premiums as a percentage of GDP) data are also useful measures for cross-country comparisons as they adjust for both population and size effects. Insurance density reflects the purchasing power of a country, while insurance penetration is generally taken as an indication on the level of development of the insurance industry. Taken together, they provide a useful indication of the importance of insurance to the country's economy.

Table1.2
Premiums by Region
(2002)

	Volume	Percentage
North America	1,049,527	40.0%
Latin America	39,920	1.5%
Western Europe	826,484	31.5%
Central and Eastern Europe	25,319	1.0%
Japan	445,580	17.0%
South and East Asia	167,286	6.4%
Middle East	11,225	0.4%
Africa	24,120	0.9%
Oceania	37,438	1.4%
Total	2,626,899	

Source: Swiss Re, Economic Research & Consulting,
Sigma No. 8/2003. Number in USD millions.

Table 1.3 presents the insurance density figures for key regions and markets. Highlighted in bold are the top two regions (inclusive of the EU but not the other trade pacts) for each category. Not surprisingly, Japan and North America have the strongest purchasing power in terms of insurance products. Interestingly for Japan, per capita expenditure on life insurance is substantially greater than for non-life insurance. This possibly reflects Japan's high level of savings via insurance products such as variable and universal life policies that contain a cash value in addition to a

death benefit. North America, on the other hand demonstrates a more balanced distribution in its per capita expenditure of life and non-life products. In terms of non-life insurance, North America clearly dominates the other markets with premiums per capita of US$1711.2 million. For the U.S. alone, this figure is even

Table 1.3
Insurance Density (Premiums Per Capita in USD)[1]
(2002)

	Life	Non-Life	Total
Africa	21.5	7.7	29.2
South and East Asia	35.5	14.8	50.2
Middle East	12.9	26.7	39.6
Latin America and Caribbean	29.1	46.4	75.5
Oceania	668.7	533.1	1,201.80
Western Europe	1,054.40	678.2	1,732.60
Japan	**2,783.90**	714.7	**3,498.60**
North America	**1,563.80**	**1,711.20**	**3,275.00**
World[2]	247.3	175.6	422.9
OECD[3]	1,233.60	872.3	2,105.90
G7[4]	1,709.50	1,212.90	2,922.40
EU[5]	1,207.90	**773.3**	1,981.20
NAFTA[6]	1,203.20	1,317.20	2,520.30
ASEAN[7]	22.9	14.4	37.3

Source: Swiss Re, Economic Research & Consulting,
Sigma No. 8/2003. Premiums in per capita USD.

[1] *Excluding cross-border risks*

[2] *Insurance density (premiums per capita) including cross-border business*

[3] *30 member countries*

[4] *US, Canada, UK, Germany, France, Italy, Japan*

[5] *15 member countries*

[6] *US, Canada, Mexico*

[7] *Singapore, Malaysia, Thailand, Indonesia, Philippines, Vietnam. The three remaining member countries (Brunei, Laos and Myanmar) are not included*

at US$ 1,799 per capita (Swiss Re, Sigma, 2003, No. 8, pg 36). Given the important role of non-life insurance in encouraging entrepreneurial risk taking and business investment and trade, this could be an indication as to the source of the business

dynamism and innovation that the U.S. economy is so well known for. This is in contrast with Japan, where the dominance of the global life insurance points to its high level of savings as the source of her economic strength[4]. Overall however, the difference between the two is marginal, with the Japanese market only possessing slightly more purchasing power than the U.S. (US$3498.6 million versus US$3275 million respectively).

Looking at insurance penetration rates, a similar pattern can be discerned. Generally, the markets having the highest level of insurance penetration are the industrialized countries, in keeping with the consensus that the development of the insurance market is beneficial to the overall economic and financial development of a country.

Here the figures reveal that the Western European (5.22 percent) life insurance markets are generally more developed than North America (4.48 percent) in proportion to Gross Domestic Product (GDP). This is due to countries like Switzerland, France, Germany and the United Kingdom (U.K.) that have highly developed insurance markets. However, Japan as before registers the highest insurance penetration rate of 8.64 percent of GDP. For the non-life industry, Japan (4.90 percent) and Oceania (3.57 percent) have the highest insurance penetration rates; overall, it is still Japan (10.86 percent) and North America (9.39 percent) that have the most developed insurance markets.

[4] Studies (IMF (1995)) have shown that on average, high savings rates tend to correlate with economic growth, *ceteris paribus*.

Table 1.4

Insurance Penetration (Premiums as a % of GDP)[1] (2002)

	Life	Non-Life	Total
Africa	3.28	1.17	4.45
South and East Asia	3.45	1.44	4.89
Middle East/Central Asia	0.53	1.1	1.64
Latin America and Caribbean	0.92	1.47	2.39
Oceania	4.48	**3.57**	8.05
Western Europe	**5.22**	3.36	8.58
Japan	**8.64**	2.22	**10.86**
North America	4.48	**4.9**	**9.39**
World[2]	4.76	3.38	8.14
OECD[3]	5.33	3.77	9.1
G7[4]	5.63	4	9.63
EU[5]	5.3	3.39	8.69
NAFTA[6]	4.29	4.7	8.99
ASEAN[7]	1.79	1.13	2.92

Source: Swiss Re, Economic Research & Consulting, Sigma No. 8/2003. Premiums as a % of GDP.

[1] *Excluding cross-border risks.*

[2] *Insurance penetration (premiums as % of GDP) including cross-border business.*

[3] *30 member countries.*

[4] *US, Canada, UK, Germany, France, Italy, Japan.*

[5] *15 member countries.*

[6] *US, Canada, Mexico.*

[7] *Singapore, Malaysia, Thailand, Indonesia, Philippines, Vietnam. The three remaining member countries (Brunei, Laos and Myanmar) are not included.*

1.3 Research Motivation and Contributions

This thesis is a pioneer study in international financial services in both depth and content. Several issues in risk and insurance are examined within the area of international financial services, where these topics are studied for the first time. These include issues relating to 1) life insurance demand; 2) foreign participation and

the international insurance establishment trade[5], and 3) foreign exchange risk exposure and risk management strategies. In addition, methodological improvements are also made over prior studies within these areas.

Moshirian (1994a, 2004) discusses the four categories in international trade in financial services as defined under GATS. These include:

1 No movement of providers or receivers;

Where the trade in international financial service is done without either party having a physical presence in the other country, similar to the exchange of physical goods and services.

2 Movement of providers only

This constitutes Foreign Direct Investment in the host country where the multinational bank or insurance company establishes local branches. Such form of investment is increasingly gaining in importance and magnitude with the continued liberalization push from the Uruguay Round of Trade Negotiations and the GATS

3 Movement of receivers

Such trades require the recipients of these services to physically move to the location of the financial service provider.

[5] Carter (1990) separates transactions in international insurance into the establishment business and cross-border trade. As in Ma and Pope (2003), international insurance establishment trade refers to the former category.

4 Movement of both providers and receivers

Here, both service providers and recipients are mobile, with the transaction occurring in a country foreign to both provider and receiver.

This thesis contributes to the international financial services literature by addressing issues relating to insurance and risk under the above categories. To that end, three distinct topics in risk and insurance are addressed. Specifically, Chapter Two looks at the determinants of the demand for total life insurance in OECD countries. In that regard, the study is relevant to category one through three. Included in Chapter Two are transactions that involve both domestic business and various forms of international cross-border transactions. For example, an Australian citizen working in Hong Kong might purchase life insurance from an Australian insurer. Such cross-border transactions are thus relevant in this chapter's examination of the determinants of demand for life insurance[6].

Where Chapter Two analyzes total life insurance demand, Chapter Three separates domestic and foreign elements by looking at the establishment of trade in insurance services by foreign insurers. This study is especially pertinent to category two, which deals specifically with foreign direct investment (FDI) in a host country.

Finally, Chapter Four can also be viewed in the context of categories one through four. Here, the foreign exchange risk exposure of U.S. multinational and domestic

[6] To that effect, developments in technology and e-business solutions have certainly made such transactions easy, and highlight the importance of the Internet as the new frontier in potential business opportunities for international trade in financial services.

insurance companies is identified and several hypotheses from the literature on foreign exchange exposure are tested. Where domestic insurers are concerned, their activities can be classified under category one or three. In addition, multinational insurers also potentially perform operational hedges through the establishment of overseas branches and agencies. These are viewed as FDI in insurance and classified under category two. Furthermore, these foreign branches also allow them to conduct transactions under category four.

1.3.1 Three Key Objectives of these Chapters

Within the context of trade in financial services as outlined in the previous section, the three chapters in this thesis focus on issues relating to risk and insurance that have so far not been addressed in prior research. These generally fall into three main strands within international financial services, namely: the demand and supply of insurance, foreign participation of multinationals and the foreign exchange exposure of multinational corporations.

1.3.1.1 Demand for Life Insurance in OECD Countries

This chapter addresses the gap within the literature about the demand and supply of insurance services using data from the more developed OECD counties. So far, factors influencing the demand for property-liability insurance in developed countries (Browne, Chung and Frees (2000)) and developing countries (Outreville (1990)) have been investigated. Life insurance markets have also been looked at using a cross section of international countries (Browne and Kim (1993)), and

developing countries (Outreville (1996)); however, the literature is not reconciled in terms of how these variables relate to life insurance demand in the more developed economies. This chapter thus provides several key contributions, including:

- Being the first study on life insurance demand using a specific sample of the more developed OECD countries, this chapter bridges the non-life and life insurance literature and reconciles the validity of prior variables used.

- This chapter improves on the methodology used in previous studies by utilizing the Generalized Method of Moments (GMM), in addition to Ordinary Least Squares (OLS). Using GMM with the White variance covariance matrix also adjusts for potential heteroscedasticity while the ability to use over-identifying instruments mitigates the problem of multicollinearity, measurement errors and endogeneity, which are more difficult to diagnose and treat.

- The results of this chapter provide conclusive evidence on the validity of the variables used in both the life and non-life insurance literature for developed and developing countries, with some interesting findings. Using pooled data, all the hypothesized variables are statistically significant with their correct signs. Specifically, it is found that anticipated inflation, life expectancy, the size of foreign market share, the dependency ratio, social security expenditure, human capital endowment, and financial development are factors that explain the variation in life insurance consumption in OECD

countries. In addition, in comparing the results with exiting literature, this chapter finds that the impact of social security expenditure on life insurance demand potentially differs across countries depending on the level of economic development.

1.3.1.2 Foreign Participation in Life Insurance Markets.

A form of trade in international insurance services involves FDI flows via the establishment of production and marketing branches in foreign markets. The role of foreign insurers is increasingly important as financial markets develop globally. With progress, businesses and individuals face greater risks of loss, resulting in a higher demand for insurance protection. Where these risks develop beyond the underwriting capacity of domestic insurers, foreign insurers provide a means for such risks to be spread internationally.

The examination of what determines foreign participation levels in insurance has not been addressed in the literature of both foreign entry and demand and supply of insurance. Most of the work in foreign entry and foreign multinational participation focus on multinational banking (Goldberg and Saunders (1981), Walter and Gray (1983), Gelb and Sagari (1990), Yamori (1998) and Claessens et al (2001)), with some attention paid to international insurance (Skipper (1987), Skipper (1996) and Skipper and Klein (2000)). This chapter aims to provide documentary evidence on what influences the decision of foreign life insurers to participate. In doing so, it reconciles and extends the literature on 1) FDI and the international insurance establishment trade; and 2) life insurance demand. In doing so, this chapter provides

a framework in which to understand what influences the level of foreign participation in life insurance markets in addition to several other contributions, namely:

- It is the first study to look at the cross-country establishment of trade in insurance services by foreign life insurers. The model used in this chapter also incorporates socio-economic control variables from the literature on insurance demand with the market structure variables used in Ma and Pope (2003), who look at foreign insurers' participation in non-life markets. In doing so, this chapter extends the literature on demand for life insurance.

- An improved methodology is used over Ma and Pope (2003), who use OLS estimation. This chapter uses the more advanced GMM estimation to account for potential heteroscedasticity, multicollinearity, endogeneity and measurement errors. In addition, three models are tested, including a domestic model and two specifications for foreign participation, allowing for the identification of any significant differences in the factors that influence domestic and foreign participation levels.

- The results of this chapter are particularly revealing. The market structure characteristics that influence the level of domestic and foreign participation levels are found to be different. The results suggest that the level of openness of the domestic economy is what drives foreign life insurer participation. On the other hand, domestic participation is driven more by the underlying level of competition in the domestic life insurance market. The results also reveal a

systematic difference in the market structure characteristic that drives foreign participation between life and non-life markets. This chapter argues that this is due to the difference in the size of the life and non-life insurance sectors. In addition, this chapter also finds that social security expenditure, human capital endowment, the level of financial development and income are all significant determinants of foreign insurers' level of participation. These results further confirm the validity of location-specific advantages within the eclectic framework in viewing international insurance establishment trade.

1.3.1.3 Foreign Exchange Exposure: Evidence from the U.S. Insurance Industry

In keeping with the theme of this thesis where issues on risk and insurance within international financial services are examined, this chapter focuses on the foreign exchange risk that U.S. insurers face, which has not yet been looked at within the foreign exchange exposure and currency risk management literatures. This topic is particularly appropriate given the sizable role the U.S. insurance industry plays in the global insurance market. In 2002, according to Swiss Re (Sigma, 2003, No 8), the U.S. was the world's largest insurance market in terms of premium volume, accounting for 38.1 percent of the global market.

This chapter has two broad aims. 1) To identify the level of foreign exchange exposure of U.S. insurers, and 2) to test the applicability of several underlying theories (including the identification of operational, size and time horizon effects in influencing the foreign exchange exposure of U.S. insurers) from the literature on foreign exchange exposure and currency risk management to the U.S. insurance

industry. In doing so, this chapter extends the literature on foreign exchange exposure of financial institutions, and provides a basis for comparison with the existing work done using multinational banks. This is especially valuable given the similar and unique roles of both insurers and banks and their central role in economic development and the efficient functioning of a country's financial markets. In addition, this chapter:

- Uses an alternative methodology that overcomes two limitations in the existing literature on foreign exchange exposure identification. The first of these arises from the averaging effects of using aggregate data that make the identification of foreign exchange exposure difficult. The second limitation concerns the problem of investor mispricing, which is potentially present when foreign exchange exposure is examined in the context of stock returns using a contemporaneous model[7].

- Documents the importance of foreign exchange exposure management to the U.S. insurance industry as reflected by the large percentage of insurers that exhibit significant foreign exchange exposure. In addition, evidence is found indicating the presence of operational and time horizon effects that impact on the frequency of foreign exchange exposure that U.S. insurers face. The results corroborate several theories in the literature on

[7] As Bartov and Bodnar (1994) suggest, this arises due to the complexity of foreign exchange effects that imply a lagged model is more suitable since that takes into account the time that investors take to process these effects of foreign exchange changes on future profitability and hence firm value as measured by stock returns.

currency risk management and suggest that domestic insurers tend to face higher incidences of foreign exchange exposure. Generally, large insurers benefit from cost and informational economies of scale in currency risk management that allow them to undertake superior hedging strategies. Financial risk managers also tend to prefer hedging against short-term foreign exchange transaction exposure rather than longer-term foreign exchange economic exposure. This in part is due to the ease of using currency derivatives for transaction exposure, and the fact that economic exposure is often much harder to ascertain and measure.

1.4 Thesis Structure

This thesis explores issues relating to risk and insurance and extends the literature in their respective areas. In addition, methodological improvements are made over previous studies. The remainder of this thesis is organized as follows.

Chapter Two examines the demand determinants of life insurance in OECD countries using data from 1993 to 2000. A review of the demand and supply literature from both life and non-life insurance is made, followed by an overview of the variables that Chapter Two hypothesizes are potential demand determinants with their corresponding justifications based on existing literature. The methodology is next discussed followed by the presentation of this chapter's empirical results, their implications, and a chapter conclusion.

Chapter Three presents a similar format. Here factors influencing the level of foreign participation by life insurers are analyzed. An overview of the literature on the role and importance of foreign participation as well as the determinants of foreign participation and FDI in insurance services is presented followed by the hypothesized socio-economic and market structure variables to be tested. Next, the model to be used is presented followed by the empirical results and chapter conclusion.

Chapter Four looks at the foreign exchange exposure of U.S. insurers. The literature on this subject is diverse given that several issues have to be dealt with to place the topic in the right context within international financial services. These include the similarities between banking and insurance; the nature of foreign exchange exposure, and issues relating to foreign exchange exposure and financial institutions, firm value, international trade and hedging. Next, the hypotheses are outlined together with their theoretical justifications, followed by the methodology section, where econometric issues are addressed, providing a background in understanding the formalized model. Finally, the results are presented together with the chapter conclusion.

Chapter Five provides an overall conclusion from the results of the three topics examined in addition to the implications and significance of these findings to existing literature. In addition, suggestions are made identifying potential avenues for further research.

CHAPTER 2

DEMAND FOR LIFE INSURANCE IN OECD COUNTRIES

2.1 Introduction

In the past, research on trade in international financial services has been hampered by the lack of available data. Recent improvements in the collection of national statistics on international trade in financial services by countries in the last decade have however now provided the means for increased research in these areas (Moshirian (2004)). Consequently, research in financial service activities by member countries of the OECD has been made possible through these efforts.

With increased volumes of international trade in insurance services, the factors influencing the demand and supply of insurance have received some attention. Recent empirical studies on the demand for insurance focus principally at either the international level, or on less developed economies. These include the works by Browne and Kim (1993) and Outreville (1996) for life insurance, as well as Outreville (1990), Browne, Chung and Frees (2000) and Ma and Pope (2003) for the area of non-life insurance.

To date, existing research has yet to establish factors that determine demand for life insurance in the more developed economies. Browne and Kim (1993) study the factors that explain variations in the demand for life insurance across a spectrum of international countries while Outreville (1996) looks at life insurance markets from the context of developing economies.

In light of the above, this chapter provides several significant contributions to existing literature. Firstly, this chapter reconciles existing literature on non-life insurance with the studies done in the area of life insurance demand in developing countries, and provides a basis for a more complete picture on the factors that affect the overall demand for insurance (both life and non-life) through the different stages of economic development. This is especially important for policymakers given the increased role and importance of insurance as we move into the 21st century. Furthermore, methodological improvements are made to overcome the potential data limitations such as measurement errors, heteroscedasticity, endogeneity and multicollinearity, using the more advanced technique of GMM.

The results indicate that anticipated inflation, life expectancy, the level of foreign insurers market share, national income, dependency ratio, social security expenditure, education and financial development all play significant roles in determining the level of life insurance consumption in OECD countries. In addition, these variables display the correct hypothesized relationships in agreement with existing literature. The results also suggest that the level of social security expenditure potentially differs depending on a country's level of development. In addition, policymakers should pay special attention to the level of financial

development and foreign market share in making future regulatory decisions since the results suggest targeting these areas has potential benefits to the life insurance sector.

The structure of this chapter is as follows: Section 2.2 provides an overview of existing literature as pertaining to life and non-life insurance. Section 2.3 outlines the empirical hypotheses to be tested, as well as the model for life insurance demand. In addition, model specification tests are discussed. In Section 2.4, the data and methodology are elaborated upon while Section 2.5 provides the empirical results together with their corresponding implications. Finally, Section 2.6 concludes with the main findings of this chapter, together with a discussion and suggestions for further research.

2.2 Literature Review

The main aim of this chapter is to establish the determinants of total life insurance demand using a sample of OECD countries. For this purpose, a review of existing literature will help us understand the prior work already done in the area of life insurance demand and more specifically on what determinants are relevant to this study.

2.2.1 Demand for Life Insurance

Many studies extend from the uncertain lifetime life cycle model first theorized by Yaari (1965) [8], where the demand for life insurance is considered within the context of the consumer's lifetime allocation process. Here, it is assumed that the level of risk aversion between utility maximizing households remains the same, although there is some evidence to indicate that inter-country differences do affect the level of risk aversion and hence the demand for life insurance[9]. Lewis (1989) extends this seminal paper by placing the expected utility from the perspective of the beneficiaries. Thus, the level of life insurance consumption is based on the beneficiaries expected lifetime utility.

Following Yaari (1964, 1965) and Hakansson (1969), there are several variables that influence the demand function derived from the maximization of the utility function of the consumer. These include, wealth levels, income streams, interest rates, and prices, including insurance premium rates, and the consumer's subjective discount functions. Also, the findings of Lewis (1989) suggest that the optimal life insurance policy and hence the demand for life insurance would be a function of several factors. These include the wage earner's probability of death, the degree of risk aversion, the present value of the survivors' consumption stream, the policy loading factor and the size of the bequest.

[8] For a review of the literature refer to Lewis (1989) and Babbel and Ohtsuka (1989).

[9] Viscusi and Evans (1990) and Browne and Kim (1993).

Moving away from the theoretical development of life insurance demand models, much empirical work has also been done on an industry level to identify the factors influencing life insurance consumption. Some of these variables include industry advertising expenses, size of the industry sales force, introduction of new products, expected inflation, consumer expectations, new household savings rates, alternative asset yields, births, marriages, household formation rates, disposable income, race, geographical location, nationality and education. According to Babbel (1985), many of these variables such as industry advertising expenses, size of industry sales force seem to only affect sales over a short period of time, while other variables like births, marriages, household formations, expected inflation, interest rates have been shown to exhibit ambiguous impact on life insurance consumption, depending on the sample time period and lag specifications used. For the purposes of this chapter, cross-country financial, economic and demographic variables are focused upon and not the micro demand determinants that are mainly used in within country studies. The following provides a succinct overview regarding life insurance demand determinants.

Headen and Lee (1974) postulate that the demand determinants for life insurance can be generally separated into three basic categories:

1) Variables that stimulate demand as a result of the marketing effort of the insurance company.
2) Variables that influence the size of the potential market and the ability to buy; and,

3) Variables that affect household decisions to save and accumulate financial assets along with variables that determine the composition of those assets.

The first category deals with direct causal factors on the part of the insurance company that *stimulate* demand, such as industry advertising expenditures, size of companies sales force, as well as the introduction of new product offerings or new policy types tailored to the needs of specific consumer segments.

The second category concerns variables that either directly or indirectly affects the size of the potential market as well as the ability to buy. In other words, these are factors that influence the size of the industry pie. This is in contrast to the previous category, which concerns extracting as much demand out of a fixed market, *ceteris paribus*. These variables include the level of disposable household wealth, as well as population-related factors such as birth rates, death rates, marriages and life expectancy.

Finally, the third category takes into account factors like education and risk aversion, which influence the household choices in terms of life insurance purchases. This category also considers life insurance within the larger universe of financial assets. These include variables relating to net savings rates and the composition of substitutable financial assets. Relevant factors here include net household savings rates, short and long term yield rates and holding returns among alternative assets, consumer expectations concerning future economic conditions and the flow of funds into alternative financial assets.

On a broad level, empirical research in the area of life insurance demand can be classified into cross country and individual country studies with methodologies ranging from ordinary least squares regressions to panel data models. The types of variables examined can also be separated into macroeconomic, demographic, social, and psychographic, amongst others. This study focuses on the impact of macroeconomic and demographic variables on the demand for life insurance. As such, this section provides an overview of the main studies relating to this area.

From a cross-country perspective, Browne and Kim (1993) investigate the drivers of life insurance demand across a range of international countries. The authors find that the dependency ratio, national income, government spending on social security, inflation, price of insurance and religion have significant influence on life insurance consumption. In another study, Outreville (1996) investigates empirically the relationship between life insurance premiums with the financial development as well as other socio-economic variables. Using a cross- section of 48 developing countries and ordinary least-squares regression for data from 1986, evidence for the negative effects of a monopolistic market on life insurance growth are documented. Thus, for less developed countries, life insurance markets are significantly related to the market structure of the country, disposable income, as well as the level of financial development and anticipated inflation.

Besides the above-mentioned variables, the examination of psychographic variables by several authors has also added some valuable insight to understanding the demand for life insurance. Burnett and Palmer (1984) look at both psychographic and demographic factors in studying the effect on life insurance ownership. Sampling

from a consumer panel of about 400 individuals and using Multiple Classification Analysis, the authors find that work ethic, socialization, fatalism, preference, religion salience, and assertiveness were the most important predictor variables, together with education, number of children and income as the best demographic variables.

Aside from cross-country studies, several authors also examine life insurance demand using individual countries. This is especially useful for analyzing time series developments in life insurance consumption patterns or cross sectional comparisons across different demographic groups. Looking across different U.S. households, Hammond, Houston and Melander (1967) examine the relationship between life insurance premium and income, net worth holdings, the stage in life cycle of the household and the occupation of the household head. Headen and Lee (1974) examine the short-run behavior of life insurance demand as it is influenced by changes in financial market conditions and changes in the household demand for alternative financial assets. They find indications that low-asset holders view life insurance as an alternative investment asset. They also find evidence supporting the roles of consumer sentiment, interest rates and savings rates in determining both short term and long-term household asset allocation decisions. This is especially important as the behavior of household portfolio decisions may determine, at least partially, the demand for life insurance. This follows from Fortune (1973), which makes a strong case for the recognition that life insurance may be a substitute for financial assets such as equities or other perhaps lower risk assets.

Also using U.S. data, Chen, Wong and Lee (2001) separate out the age, cohort and period effects within the main social, economic and demographic effects that are the

focus of previous research. Using the cohort analysis method, they find that baby boomers tend to purchase less life insurance than their earlier counterparts and that this phenomenon consequently led to the decline of recent life insurance purchases in the U.S. In addition, they also find that men show a strong age effect and strong negative cohort effects while women have strong positive cohort effects.

2.2.2 Demand for Non-Life Insurance

The literature on non-life insurance can also provides several useful leads in identifying potential determinants of demand for life insurance for two main reasons. Firstly, the nature of the life and non-life insurance sectors exhibits similarities in the sense that both deal with risk aversion and aim to protect individuals, families and companies against unexpected events and their consequent losses. To that extent, some of the exogenous variables used in non-life insurance research would be applicable in explaining the variation in demand for life insurance. Secondly, the methodology used in existing literature for non-life insurance is relevant to the life insurance sector as the nature of the variables would generally be similar[10] and the econometric issues (such as measurement errors and endogeneity) relating to measuring these variables would be present in both cases. Thus, this chapter also extends upon previous research in non-life insurance, and in doing so, helps to improve our understanding as to how the determinants of demand for non-life insurance relates to the life insurance sector.

[10] See Outreville (1996), Outreville (1990), Browne and Kim (1993), Brown, Chung and Frees (2000).

Much work has also been done in the area of non-life insurance. One seminal paper in the area of property-liability insurance is Outreville (1990). Using a cross section of 55 developing countries, the author investigates the relationship between property-liability insurance consumption and the financial and economic development of a country. It finds that the variation in consumption of property-liability insurance can be explained by the financial development and complexity of financial assets[11] of that country. In extending this work, Outreville (1996) finds that the level of financial development has a significant impact on the development of the life insurance sector in non-industrialized countries. In this chapter, a measure of financial development is included as an explanatory variable in total life insurance consumption.

In a more recent study, Brown, Chung and Frees (2000) look at the variation in property liability insurance consumption using data from OECD countries from 1987 to 1993. Focusing on the motor vehicle and general liability lines of insurance, they find that factors significant in explaining the variations in both lines of insurance include income, wealth, the percent of a country's insurance market controlled by foreign firms, and the form of the legal system in the country. Also, it finds that economic conditions affect the demand for insurance differently across lines of coverage. In particular, income was found to have a much larger effect on motor vehicle insurance consumption than on general liability insurance consumption.

[11] See Jung(1986).

2.3 Determinants of Demand

Prior research on life insurance demand includes macroeconomic (income, social security, anticipated inflation, etc) and/or demographic variables (Life expectancy, dependency ratio, education, etc). Some of these variables have been used in studies of non-life property-liability insurance consumption (Brown, Chueng and Frees (2000), Outreville (1990), Beenstock, Dickinson and Khajuria (1988), Ma and Pope (2003)), while others have been used in studies of life insurance demand (Hammond, Houston and Melander (1967), Burnett and Palmer (1984), Outreville (1996)).

In this chapter, the model used incorporates explanatory variables from the literature on *both* life and non-life insurance. Here, eight key variables are identified from the literature, including:

1) Anticipated Inflation
2) Life Expectancy
3) Foreign Participating Companies Market Share
4) National Income
5) Dependency ratio
6) Social Security Expenditure
7) Education
8) Financial Development

The following subsections discuss the hypothesized relationships of these selected variables with regard to the demand of life insurance.

2.3.1 Anticipated Inflation

The effect of inflation on savings through life insurance has been has been well documented. Neumann (1969) finds that price expectation had no discernible effect on savings through life insurance in the U.S. post-war years. This result however is subject to the caveat that the conclusion is based on the prevailing unique economic conditions during that period of study. Fortune (1973) also documents the negative effect of inflationary expectations on insurance consumption due to decreased consumer confidence.

Empirically, Cargill and Troxel (1979) document the negative relationship between anticipated inflation and life insurance consumption. Their results suggest that inflation has negative consequences on life insurance demand through the alteration of the consumption pattern of the industry's products. Using Brazilian data, Babel (1981) find that even when price indexed adjusted life insurance products are used, the demand for these products are still affected by the deleterious effects of inflation, leading to a reduction in demand during periods of high inflation. The author suggests that this was due to the timing of the adjustment of the insurance policy. Since these were made only during the beginning of the year, the real value of the life insurance policy is reduced should the policyholder die during a year of high inflation. Outreville (1985), Browne and Kim (1993) and Outreville (1996) also provide further evidence regarding the negative effect on savings through life insurance.

Thus, it is hypothesized that demand for life insurance is negatively related to anticipated inflation. Browne and Kim (1993) use the average inflation rate over the prior two and eight years while Outreville (1996) use a weighted average realized price changes over five years. To proxy anticipated inflation, this chapter uses two measurements. As an adaptive measure where historical movements in inflation are used as a gauge for future inflation levels, the average inflation rate over the previous five years is used. This is consistent with the delayed information hypothesis of Choate and Archer (1975) where the expectation of inflation is based on past inflation rates. In addition, an inflation index that measures anticipated inflation using a rational expectations approach is used. This follows from Chen, Roll and Ross (1986) who investigate whether macroeconomic variables systematically affect stock market returns. Here, their measurement of changes in expected inflation is based on changes in the short-term interest rates. This chapter adopts their definition of changes in expected inflation to construct a rational expectations inflation index. In this case, changes in short-term interest rates are added to a 1983 (this represents a 10 year lag prior to the starting period of the sample) inflation benchmark based on the average of the previous five years rate of inflation (as per the previous measure of anticipated inflation). This inflation index differs from the other measurement as the changes in short term interest rates reflect the market's forward-looking rational expectations of what the anticipated rate of inflation is. This is in contrast to the previous proxy of anticipated inflation, where anticipated inflation is adapted from historical inflation levels.

2.3.2 Life Expectancy

In theorizing about life insurance demand, Lewis (1989) extends the existing uncertain life cycle framework by setting the household's goal as the maximization of the beneficiaries expected lifetime utility. According to his findings, life insurance consumption increases with the wage earner's probability of death. Thus, if a person's average life expectancy is a proxy for the probability of death, we would expect there to be a negative relationship with insurance consumption since a *higher* life expectancy level indicates a *lower* probability of death. This relationship is tested in Browne and Kim (1993), however the life expectancy variable lacked significance in some models.

An alternative relationship according to existing literature follows from Outreville (1996) where life expectancy is used as a proxy for the actuarially fair price of insurance in a developing country. The results find a positive and significant relationship, with the rationale being that a longer life span reflects in a lower actuarial price for insurance as well as a greater incentive for human capital accumulation. Thus, a longer life expectancy is expected to have positive impact on the demand for life insurance.

Given the existing evidence, this chapter hypothesizes that the average life expectancy of a country's population does have an influence on the level of life insurance demand, and the influence can either be of a positive or negative nature. A higher average life expectancy will have a positive impact if a longer life span results in a lower relative price of insurance, leading to greater incentives for human capital

accumulation. On the other hand, if lower levels of life expectancy indicate a higher probability of death, wage earners would have an incentive to protect their dependents against such an outcome, hence there would be a negative impact of average life expectancy on life insurance demand.

2.3.3 Size of the Foreign Market Share

From the perspective of the insured, the level of foreign participation in the domestic market would have an effect on the level of insurance consumption for several reasons. Firstly, the extent of foreign presence in the market would provide an indicator as to the level of openness of a country's insurance industry. In addition, the accessibility of the domestic market would also be a function of the level of protection as well as regulatory intervention that affect the attractiveness of the domestic market to foreign insurers (Outreville (1996)). This would in turn directly impact upon the general level of insurance prices in that country. Thus, the level of foreign market share can be taken as an indirect measure of price.

Skipper (1987) investigates the nature of protective trade barriers in international insurance services and the rationales for protectionism and states that many countries impose trade barriers to protect their local insurance industry from foreign competition. This is especially pertinent as the driver of foreign market share can be hypothesized to derive from either protective barriers, or from the competitiveness of the market. According to Brown, Chung and Frees (2000) there can be two possible relationships between the level of foreign market share and the demand for property–liability insurance. Similar to Outreville (1996), the level of foreign market share

could have a positive impact on life insurance consumption according to economic theory which states that *more* protective barriers to trade may result in a less competitive market leading to generally higher prices and poorer quality goods. Alternatively, should the driver of the level of foreign market share be the level of competition in the domestic market and not the level of market protection, the relationship between the demand for life insurance and foreign market share will be negative. This follows from a more competitive domestic market leading to a higher level of demand and represented by a lower level of foreign participation (due to less profitable prospects). Empirically, they find that for the motor vehicle line of insurance the foreign market share variable was negative and significant, in contrast to the general-liability line that came up positive and significant.

Outreville (1996) uses a dummy variable to control for the presence of foreign insurers in the developing countries life insurance markets. This chapter uses actual foreign market share figures, which hold more informational content. Here, foreign market share is defined as the market share of foreign controlled undertakings, as well as branches and agencies of foreign undertakings to total domestic business on a gross premiums basis.

This chapter hypothesizes that the relationship between foreign market share can be either positive or negative. If low levels of foreign participation stem from a more competitive market and hence reduced incentives for market entry, then a negative relationship is expected. However, if these low levels stem from the presence of trade barriers and other form of barriers to entry (resulting in a less competitive domestic market), then a positive relationship is expected.

2.3.4 National Income

In the theoretical models of insurance demand as developed by Hakansson (1969), Fischer (1973), Fortune (1973), Campbell (1980) and Lewis (1989), it is shown that there is a positive relationship between income and life insurance consumption. Empirically, Beenstock, Dickenson and Khajuria (1988), Truett and Truett (1990), Browne and Kim (1993) and Outreville (1996) find positive relationships between life insurance demand and income. This derives from the increased affordability of life insurance products due to a larger disposable income. In addition, larger incomes result in greater opportunity costs in terms of income forgone toward the dependents and beneficiaries in the event of an untimely demise. Thus, there would be an increased need for protection and a consequent increase in life insurance demand. This follows from the findings of Lewis (1989) where the demand for life insurance is positively related to the present value of the survivors' consumption stream.

The literature on property-liability insurance also supports the hypothesis that income has an influence on the demand for insurance. Beenstock, Dickinson and Khajuria (1988) find a positive relationship between spending on property-liability insurance and income. In addition, Outreville (1990) finds a positive relationship between income and property-liability insurance market development.

Consequently, it is hypothesized that the demand for total life insurance is positively related to income. Here, following Outreville (1996), nominal GDP per capita is used as the proxy for disposable income.

2.3.5 The Number of Dependents

Consistent with Burnett and Palmer (1984), Campbell (1980) considers the impact of dependents on life insurance consumption and finds in his theoretical article that the protection of dependents against financial hardships is one of the core reasons that drive life insurance consumption.

One of the findings of Lewis (1989) is that the demand for life insurance would increase with the present value of the family members' consumption, assuming that the wage earner survives. Browne and Kim (1993) suggest that this finding extends to a positive correlation between insurance demand and a country's dependency ratio. Outreville (1996) also tests the influence of the number of dependents as suggested by Beenstock, Dickinson and Khajuria (1986) and Browne and Kim (1993), but fails to find a statistically significant relationship.

The number of dependents is thus hypothesized to have a positive relationship with demand for total life insurance. A greater number of dependents would result in a higher present value of the family's consumption. Consequently, there will be a greater need for protection to guard against the untimely death of the principal wage earner. Consistent with Browne and Kim (1993) and Outreville (1996), this chapter defines the dependency ratio as the ratio of dependent, under 15 and over 64, to the working age population aged between 15-64 years.

2.3.6 Social Security Expenditure

The expected direction in which social security expenditure influences the demand for life insurance cannot be ascertained *a priori*. As argued by Browne and Kim (1993), to the extent that social security benefits only continue subject to the survival of the wage earner, these benefits would result in an increased need and ability to pay for life insurance protection via the increased level of wealth that these social security benefits represent. The rationale is that social security benefits allow wage earners to purchase life insurance protection that will allow them to extend the benefits of their social security beyond their lifetime, where the social security benefits cease. Thus, social security expenditure may be positively related to the level of life insurance demand.

Alternatively, the influence of social security expenditure could also have a negative influence on the level of life insurance consumption. Skipper and Klein (2000) in looking at insurance regulation in terms of the public interest, states that insurance, *especially* life insurance, can act as a substitute for government social welfare programs. In addition, given that the source of social security benefits comes from tax revenues, more generous the social security programs would be reflective of more wealthy countries. Thus social security programs could also proxy national wealth (Browne and Kim (1993)). In addition, Lewis (1989) has also shown that wealth behaves as a substitute for life insurance as it serves to offer the same protection that life insurance offers. As such, social security expenditure could have a negative relationship with demand for life insurance due to this substitution effect of wealth.

In this chapter, it is hypothesized that social security expenditure is related to the demand for life insurance but the sign of that relationship is unknown. Here, as in Browne and Kim (1993), social security benefits are measured by taking the governments' aggregate public social expenditure. Ideally, a better measurement would be disaggregate data that relates more closely to life insurance, however data availability prevents the use of such a measurement in this chapter.

2.3.7 Human Capital Endowment

The level of human capital endowment of the population can be proxied by the level of education, and would undoubtedly influence the level of life insurance consumption. Browne and Kim (1993) postulate that, in general, a higher level of education may result in an increased level of risk aversion through a greater awareness of the uncertainties in life and the necessity for protection via life insurance. More education also potentially reflects a greater ability to explore the various options involved in protecting the wage earners' dependents, *ceteris paribus*. In addition, increases in the length of education also reflect increases in the period, and cost of dependency, consequently resulting in an increase in the need for protection through life insurance. Thus, the level of education would be positively related to the demand for life insurance.

According to Outreville (1996), the level of human capital endowment represented by education would also have a positive relation with life insurance consumption. Consistent with Jung (1986), this arises from his supply-leading causality model on the pattern of development for developing countries, where the level of human

capital endowment constitutes an important comparative advantage in financial services.

The literature on property-liability insurance also documents the positive relationship between education and the variation in demand for life insurance. Consistent with Browne and Kim (1993), Browne, Chung and Fees (2000) postulate that higher levels of education (or human capital endowment) serve as a proxy for risk aversion, which potentially results in a greater propensity to invest in life insurance protection.

This chapter hypothesizes that human capital has a positive impact on total life insurance demand. As a measure of human capital, the level of education is used. This is measured by taking using the tertiary Gross Enrolment Ratio (GER), which is defined as the total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school-year. In accordance with the UNESCO Institute of Statistics, the formula used is:

$$\mathrm{GER}_{\mathrm{h}}^{\mathrm{t}} = \frac{E_h^t}{P_{h,a}^t} * 100$$

Where

GER^t_h= Gross Enrolment Ratio at tertiary level of education h in school year t;

E^t_h = Enrolment at the tertiary level of education h in school year t;

$P^t_{h,a}$ = Population in age group a which officially corresponds to the tertiary level of education h in school year t.

2.3.8 Financial Development

To date, few studies have focused on the impact of financial development on the demand for life insurance. Outreville (1990) points out this importance of the financial development of a country to non-life insurance market, and documents the positive impact of financial development on property – liability insurance across 55 countries. In addition, Outreville (1996) argues that the demand for life insurance is a function of the country's level of financial development since it creates a larger set of household financial investment opportunities. He documents a positive relationship between the complexity of the financial structure[12] and life insurance consumption.

It is thus hypothesized that financial development is positively related to the demand for life insurance. To measure financial development, Yamori (1998) uses the ratio of M2 to GNP while Outreville (1990 and 1996) uses the ratio of M2 to GDP. This is generally identified with the growth of the real size of the financial sector in absolute terms, and in relation to GDP or national wealth, i.e. financial deepening. For the purpose of this study, the definition as suggested by Outreville (1990) is used as it focuses on developing countries and thus gives this study a basis for comparison.

[12] Defined as the ratio of quasi-money (M2-M1) to the broad definition of money (M2).

2.3.9 ***Model for Life Insurance Demand***

Given the above-specified hypotheses, the following model for total life insurance demand is proposed with their expected signs:

$$LF = f[AI, LE, MS, IN, DR, SS, EDU, FD]$$
$$(-)\ (?)\ (?)\ (+)\ (+)\ (?)\ (+)\ (+)$$

Where,

LF= Demand for total life insurance (per capita in USD);

AI= Anticipated Inflation (average of previous 5 years inflation, AI or inflation index, AI1);

LE=Average Life Expectancy;

MS=Foreign Participants' Market Share;

IN=Income (nominal GDP per capita in USD);

DR=Dependency Ratio (under 15 and over 64/ 15-64);

SS=Social Security Expenditure (per capita in USD);

EDU= Human Capital (Tertiary GER);

FD=Financial development (M2/GDP);

2.3.10 Model-Specification: Box Cox Transformation

Existing literature mainly use a linear or log-linear form for estimation purposes. In terms of interpretation, both forms are linear in parameters with the linear model reflecting the relationship between variables in absolute terms and the log linear form reflecting it in terms of elasticity.

Outreville (1990) uses a log-linear form to model demand for non-life insurance in developing countries, while Outreville (1996) uses both a linear model and semi-log model to estimate life insurance consumption, with the dependent and income variable estimated using both a log and linear form. In addition, Browne and Kim (1993), Browne, Chung and Frees (2000)[13] use a log linear and lin-log model in their studies of life insurance demand and property-liability insurance demand respectively. In a more recent paper, Ma and Pope (2003) also use a log specification for their model on international insurers' participation, where a log specification was used for macroeconomic variables like GDP, FDI, the inverse of the loss ratio (as a proxy for profitability) and the market interest rate.

Although existing literature suggest that a log form would be appropriate, for thoroughness, this chapter performs model specification tests for functional form via a Box-Cox transformation. Correct specification of functional form is especially important as the consequences of wrong functional form include estimates that are biased, inconsistent and inefficient, which could lead to wrong inferences being

[13] This excludes the income variable, which is a linear specification.

drawn. Essentially, the Box-Cox method gives us an indication of the functional form of the model based on the transformation of the linear model using λ. The value of λ is then estimated using maximum likelihood and can provide some indication as to what the appropriate functional form should be (This method is not conclusive but does provide a useful gauge of functional form. A λ value closer to 0 indicates that a log form would be appropriate whereas a λ value closer to 1 indicates that a linear form would be more appropriate).

The linear form of the proposed model is as follows:

$$LF = \beta_0 + \beta_1(AI) + \beta 2(LE) + \beta 3(MS) + \beta 4(IN) + \beta 5(DR) + \beta 6(SS) + \beta 7(EDU) + \beta 8(FD) + \varepsilon$$

And the transformed model is:

$$\left(\frac{LF^{\lambda}-1}{\lambda}\right) = \beta_0 + \beta_1\left(\frac{AI^{\lambda}-1}{\lambda}\right) + \beta_2\left(\frac{LE^{\lambda}-1}{\lambda}\right) + \beta_3\left(\frac{MS^{\lambda}-1}{\lambda}\right) + \beta_4\left(\frac{IN^{\lambda}-1}{\lambda}\right) + \beta_5\left(\frac{DR^{\lambda}-1}{\lambda}\right) + \beta_6\left(\frac{SS^{\lambda}-1}{\lambda}\right) + \beta_7\left(\frac{EDU^{\lambda}-1}{\lambda}\right) + \beta_8\left(\frac{FD^{\lambda}-1}{\lambda}\right) + \varepsilon$$

Using the above, the estimated value of λ is found to be 0.22, thus indicating that a log linear model would be appropriate.

Browne, Chung and Frees (2000) specify a lin-log model where the dependent variable, measured by premium density of each of the two lines of non-life insurance,

and the income variable, measured by per capita GNP, are linear. In addition, Outreville (1996) specifies both a log and linear form for the income variables in this model. Following from these, the dependent variable and income variable are tested for linearity by performing a Box-Cox transformation on these two variables, while setting the other variables to be in logarithmic form.

Thus, the λ is estimated for the following model:

$$\left(\frac{LF^{\lambda}-1}{\lambda}\right) = \beta_0 + \beta_1 LOG(AI) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4\left(\frac{IN^{\lambda}-1}{\lambda}\right) + \beta_5 LOG(DR) + \beta_6 LOG(SS) + \beta_7 LOG(EDU) + \beta_8 LOG(FD) + \varepsilon$$

In addition, the functional form of inflation is further tested. The model specified is:

$$LOG(LF) = \beta_0 + \beta_1\left(\frac{AI^{\lambda}-1}{\lambda}\right) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4 LOG(IN) + \beta_5 LOG(DR) + \beta_6 LOG(SS) + \beta_7 LOG(EDU) + \beta_8 LOG(FD) + \varepsilon$$

The λ estimated here is 0.98, thus indicating that a linear specification for the anticipated inflation variable is appropriate.

Given the above specification tests, for estimation purposes, the model specified is:

$$LOG(LF) = \beta_0 + \beta_1(AI) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4 [LOG(MS)]^2$$
$$+ \beta_5 LOG(IN) + \beta_6 LOG(DR) + \beta_7 LOG(SS) + \beta_8 LOG(EDU) + \beta_9 LOG(FD) + \varepsilon$$

Where, $[LOG(MS)]^2$ is a control variable to account for the non-linearity of the shape of the anticipated inflation variable.

2.4 Data and Methodology

In this chapter, cross sectional data from 1993 to 2000 for the thirty OECD countries is used. These include: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, UK, and the US[14].

Data for life insurance premiums are obtained from the OECD published *Insurance Statistical Yearbook*. Here, life insurance premiums are expressed in USD per capita and defined as premiums in terms of total direct business. This in turn can be broken down into domestic companies (locally incorporated companies, inclusive of foreign controlled companies), and foreign companies (foreign branches and agencies). This study uses total life insurance premiums, defined as the sum of both domestic and foreign company premiums. One weakness however in using total premiums as a proxy for life insurance demand is that it may not be a fair representation of the total

[14] Countries excluded due to missing foreign market share data include Greece, Italy, New Zealand, and Sweden. In addition, when using the inflation index, missing data also prohibits the inclusion of the Czech and Slovak Republics.

life insurance market output. As Browne and Kim (1993) suggests, total premiums represent total sales which is price times output, and does not take into account inter-country market forces and differences due to price regulation. Given the data limitations, this chapter thus uses total premiums per capita as a proxy while recognizing its weaknesses.

Data on foreign market share is also from the *Insurance Statistical Yearbook* and defined as the ratio of the sum of foreign controlled undertakings, and branches and agencies of foreign undertakings to total domestic business on a gross premiums basis.

Inflation figures (obtained by taking the percentage change in the consumer price index of the respective countries), short-term interest rates (measured by the money market rate) and M2 are obtained from the IMF's *International Financial Statistics* CD-ROM. M2 figures are converted to USD. Population figures are from OECD *Economic Outlook: Annual and Semi-annual data, Vol 2003, release 01.* Education levels (measured by tertiary GER) are obtained from the *UNESCO Statistical Yearbook.* Social Security data is from the OECD *Public Expenditure, Vol 2001, and release 01.* Average life expectancy figures are from the *World Competitiveness Yearbook, various issues.* GDP figures and exchange rates are in nominal terms and are taken from the OECD Annual National Accounts - volume I - Main aggregates *Vol 2002 release 04.* The GDP figures are on a per capita basis and are expressed in USD. The exchange rates for countries that switched to the Euro in 1999 have those years adjusted by using the fixed exchange rate between the Euro and the domestic currency as obtained from the European Central Bank. Table 2.1 presents the

summary statistics for the regression variables used. Here, only data for the year 2000 are presented.

TABLE 2.1
Regression Variable Descriptive Statistics
2000

	Mean	*Std Dev*	*Minimum*	*Maximum*
Total Direct Insurance Premium Per Capita (LF)	1281.29	2099.82	7.79	11355.26
Anticipated Inflation (AI)	6.87	15.07	0.41	80.74
Anticipated Inflation (AI1)	6.42	16.77	-3.78	73.21
Average Life Expectancy (LE)	77.08	2.40	70.50	80.30
Foreign Participating Companies Market Share (MS)	25.22	23.83	0.00	98.17
GDP per capita (IN)	17769.67	11052.95	223.61	39080.32
Dependency ratio (DR)	0.52	0.24	0.31	1.78
Public Social Expenditure per capita (SS)	74250.41	161365.44	0.26	705707.20
Tertiary Gross Enrolement Ratio (EDU)	63.00	17.01	9.10	83.79
Financial Development (FD)	0.81	0.55	0.21	3.40

Note: (AI) is measured using the adaptive approach and (AI1) is measured using the rational expectations approach. Total Direct Insurance Premiums per capita, nominal GDP per capita and Public Social Expenditure per capita are in USD. Data presented are based on 2000 figures.

This chapter employs the OLS and the GMM estimation technique for individual year cross sectional estimation from 1996 to 2000[15]. This allows us to observe the year on year cross sectional relationships for the sample and any changes in these relationships over time to be observed. In addition, pooled cross sectional analysis is done using data for all six years.

[15] As mentioned before, data from 1993 to 2000 are utilized. Since lag instruments are used, this leaves a reduced sample from 1996 to 2000 for the tests.

2.4.1 Ordinary Least Squares

To date, OLS estimation has been the preferred method of estimation of many studies in the area of life insurance demand. Outreville (1990, 1996), Browne and Kim (1993), Browne, Chung and Frees (2000) and Ma and Pope (2003) use ordinary least squares to estimate their model parameters.

2.4.1.1 Characteristics of Ordinary Least Squares

In order to explain and justify the methodology used in this chapter, this section briefly outlines some of the fundamental statistical properties of the estimators used. The rationale for this being that different estimation techniques make different assumptions and have different finite sample properties.

Mathematically, the OLS estimator can be expressed as:

$$\hat{\beta}_{OLS} = (X'X)^{-1} X'Y \qquad (2.1)$$

The properties of this estimator can be classified into the three main categories of unbiasedness, consistency and efficiency. Given that the data is finite and that OLS assumptions apply, OLS estimators are unbiased, consistent and BLUE (Best Linear Unbiased Estimate)

The assumptions that apply here are:

- **A1**: $\text{cov}(\varepsilon_i | X_i) = 0$;

There is no correlation between the explanatory variables and residuals (i.e no simultaneity). Failure of this assumption results in *biased estimates of the coefficients* of the explanatory variables.

- **A2**: $E(\varepsilon_i) = 0$;

The expected mean of the residuals equals zero. Failure of this assumption results *in biased estimates of the constant term.*

- **A3**: $E(\varepsilon_i^2) = \sigma^2 = \text{constant}$;

The residuals are homoskedastic, i.e no heteroscedasticity. Failure of this assumption results *in inefficient estimates and biased tests of hypotheses.*

- **A4**: $E(\varepsilon_i, \varepsilon_j) = 0$;

Residuals are independently distributed (no serial correlation). Failure of this assumption results in *inefficient estimates and biased tests of hypotheses.*

- **A5**: $\text{cov}(X_i, X_j) = 0$;

Explanatory variables are independent, i.e there is no multicollinearity. Failure of this assumption results *in inefficient estimates and biased tests of hypotheses.*

In addition to these well known assumptions we also have:

- **A6**: $\varepsilon \sim N(0,\sigma^2)$, combining assumptions 2, 3 and 5;

Residuals are normally distributed. Failure of this assumption *invalidates the use of the Student t-distribution in coefficient t -tests.*

- **A7**: Explanatory variables are measured without errors;

Failure of this assumption in the explanatory variables will lead to biased and inconsistent slope coefficients and variances.

- **A8**: Variables that are time series must be stationary (no unit roots), i.e. well-defined mean and variance.

Failure of this assumption results in *spurious regressions* (except in the special case of cointegration).

If these assumptions cannot be adhered to, the estimation method will then have to be adjusted. Assumptions A2 to A6 can be determined with relative ease using statistical tests, however assumption A7 is more difficult to diagnose as endogeneity and measurement errors will exist to some extent when proxies are used in models. Assumptions A4 and A8 in this case do not apply since this chapter conducts individual year cross sectional estimations. Given the nature of the macro data that

this thesis uses, violation of the above assumptions are likely to be present, especially A3, A5 and A7.

2.4.2 Justifications for the use of the Generalized Methods of Moments

Given that one or more of the assumptions as mentioned in the previous section do not hold, GMM estimates allow us to still obtain consistent and efficient estimates[16]. Here, as suggested by Outreville (1996 and 1990), it is possible that the model would possess endogenous variables where some of the explanatory variables could be a function of other variables. Being a cross section of countries, the existence of Heteroscedasticity is potentially a problem, while the use of imperfect proxies for the explanatory variables may possess measurement errors, endogeneity and multicollinearity.

In light of the above weaknesses, GMM essentially exploits moment conditions to estimate the model's parameters consistently. Hansen's (1982) seminal paper on GMM estimators first shows that every previously suggested instrumental variables estimator in linear or non-linear models, with cross- section, time series or panel data, can be cast as a GMM estimator. This ability to use instrumental variables allows more robust estimation as it allows us to avoid problems within the data such as errors – in – variables, multicollinearity and endogeneity. More so, he also shows how to choose among the many possible method of moments estimators such as OLS

[16] To ensure efficiency, the White variance – covariance matrix is used to adjust for non – spherical errors.

and two stage least squares when there is a breakdown in some underlying assumptions such as homoscedasticity.

According to Wooldridge (2001), in addition to the *flexibility* allowed by GMM, an important feature of GMM is that it allows more moment conditions than there are parameters to estimate, i.e. it allows the parameters to be *over-identified.* In this case, we can test the over identifying restrictions to improve estimation efficiency and/or test the internal consistency of the model. This however leads to potential problems of data mining due to the subjectivity with which the moment conditions convey information that assists in the accuracy of the results.

The GMM framework also aids in determining which of the OLS assumptions are truly necessary. First, GMM requires nothing about the shape of the distribution of the error terms, so the normality assumption can be dropped. Secondly, all that is required is that the orthogonality conditions hold. Thus, as long as $E(X_i'\varepsilon)= 0$, the estimator is consistent. Furthermore, given a consistent estimate of the variance of these moment conditions, the estimator is efficient.

The instruments used should possess two main properties. They should be highly correlated with the explanatory variables and uncorrelated with the error terms. As a rule of thumb, lagged values of the explanatory variables would satisfy these conditions and these are what this chapter uses.

The GMM estimate is obtained by minimizing q with respect to the parameter estimates:

$$q = \varepsilon' Z W^{-1} Z' \varepsilon \tag{2.2}$$

Where,

Z= Matrix of instruments

W= A consistent variance – covariance matrix;

After taking the first derivative and solving for β, the slope coefficients can then be defined as:

$$\beta_{GMM} = \left[X'Z(Z'\Omega Z)^{-1} Z'X\right]^{-1} X'Z(Z'\Omega Z)^{-1} Z'y \tag{2.3}$$

And the variance – covariance matrix will be,

$$\text{var}(\beta_{GMM}) = (Z'X)^{-1} Z'\sigma^2 \Omega Z(X'Z)^{-1} \tag{2.4}$$

For the estimation purpose of this chapter, equation 2.2 is estimated using the White variance – covariance matrix to adjust for any possible heteroscedasticity. To correct for endogenous variables as well as measurement errors, an over identified estimation technique is used, reflected in equation 2.3 and 2.4. With the proper choice of instruments, the over identified estimation technique helps in mitigating the effects of multicollinarity on the GMM estimates. This comes about due to the smaller condition index from the Z'X matrix in equation 2.3 as compared to the OLS matrix, X'X.

2.5 Empirical Results

2.5.1 Results: Ordinary Least Squares

The OLS estimates using the adaptive approach for anticipated inflation (AI) are presented in Table 2.2. The average adjusted R^2 across all years is 0.8986. The results are tested for the presence of heteroscedasticity using the LM heteroscedasticity test of the residual variances. This is computed by regressing the squared residuals on the squared fitted values of the regression. The resulting test statistic, nR^2 has a Chi-squared distribution with one degree of freedom. Here, the LM heteroscedasticity test is not significant for all years thus revealing the absence of heteroscedasticity. In addition, the residuals are tested for normality as this indicates whether or not the t-statistics used are suitable. The Jarque-Bera test is used for this purpose and is based on the skewness and kurtosis of the residuals of the model, comparing them to the normal distribution's skewness, which is zero, and kurtosis, which is three. This test is Chi-square distributed with two degrees of freedom and the null hypothesis is that the residuals are normal. The Jarque-Bera tests here confirm the normality of the residuals for all years, thus affirming the reliability of the t-statistic. In addition, the presence of multicollinearity is further investigated. Table 2.7 presents the correlation matrix for the explanatory variables. As can be seen, only the life expectancy and income variables exhibit a relatively high correlation of 0.84. This however, is not especially surprising given that income and hence wealth levels would be highly correlated with a population's life span due to increased standards of living and the ability to afford better health care. In addition, the presence of multicollinearity does not affect the unbiasedness and

consistency of the regression estimates and the OLS estimators are still BLUE. To mitigate this problem, instrumental variable estimation via GMM is used with the resultant findings as described in the next section[17].

The empirical estimations reveal that the income (IN) variable is significant with the expected positive signs for all years, while the life expectancy (LE) variable and the dependency ratio (DR) are significant for 1996 with their expected negative and positive signs respectively. The human capital (EDU) variable is also positive and significant for only 1996 and the financial development (FD) variable is positive and significant for 1996, 1999 and 2000.

Table 2.3 contains the estimates using the rational expectations approach. Here, the average adjusted R^2 is 0.9123. LM Tests for heteroscedasticity and Jarque-Bera tests indicate the absence of both heteroscedasticity and the non-normality of residuals. Consistent with the above results, the income (IN) variable is also positive and significant for all years. Here, the anticipated inflation index (AI1), is negative and significant at the 5 percent level for 1996. The social security (SS), human capital (EDU) and financial development (FD) variables are also significant for both 1996 and 1999 and are positive, negative and negative respectively.

[17]As already mentioned, instrumental variables estimation reduces the impact of the problem of multicollinearity as the relatively large condition index of the OLS X'X matrix (associated with high multicollinearity) is reduced when using the Z'X matrix of instrumental variables (which has a smaller condition index). In the case of over-identifying instruments, the combination of the proper instruments with the smaller condition index as used in equation 2.3 will result in a mitigating impact of the multicollinearity on the GMM estimates.

In addition to the above year-by-year estimations, pooled OLS estimation is also done as further confirmation of the above results. These are contained in Table 2.6. Generally, the larger sample size would allow more accurate estimates to be obtained. In addition, based on the consistent results obtained in the yearly estimations, using pooled data in this case would be appropriate. Using the anticipated inflation (AI) variable, the LM hetoeroscedasticity test shows the existence of non-homogeneity in the residual variances. In addition, the Jarque-Bera test for normality is insignificant at the 5 percent level. The results confirm the individual year estimates with the expected signs. The R^2 averages about 0.8947. Only the anticipated inflation (AI) variable and the life expectancy (LE) variable are insignificant, with all other variables significant at the 1 percent level. When the inflation index (AI1) is used, the LM test for heteroscedasticity also reveals the presence of heteroscedasticity, while the Jarque-Bera test is insignificant. The estimates all possess the expected signs with all variables significant except life expectancy (LE).

2.5.2 Results: Generalized Method of Moments Estimations

The advantages to using GMM estimation have already been discussed in Section 2.4.1[18] and the implications of these can be seen from the results as presented in Tables 2.4 and 2.5. Consistent with the OLS results, all variables show significance for most years and with their correct expected signs. The Hansen J tests for over identifying instruments are insignificant for all years using both models (adaptive

[18] Namely, heteroscedasticity, endogeneity, measurement errors and multicollinearity.

approach and rational expectations), thus indicating the suitability of the instruments used.

The adaptive measurement of anticipated inflation (AI) is found to be negative and significant for 1996. The life expectancy (LE) variable is negative and significant for all years except for 1997. The foreign market share (MS) variable is negative and significant for three out of the five years in 1997, 1998 and 2000. Similar to the OLS results, the income (IN) variable is found to be positive and significant for all years. In addition, both the dependency ratio (DR) and financial development (FD) variables are now significant for all years with the expected positive signs. The social security (SS) variable is found to be negative and significant, in addition to the human capital (EDU) variable, which is found to be positive and significant for all years except 1997.

The coefficient estimates for the model using the rational expectations specification of anticipated inflation shows consistent results with the adaptive approach. The inflation index (AI1) is negative and significant for 1996 and 1997. The life expectancy (LE), foreign market share (MS) and dependency ratio (DR) variables are all significant with the correct signs (negative, negative and positive) for all years except 1999. The social security (SS) variable, with a negative sign, financial development (FD) variable, with a positive sign, and income (IN) variable, with a positive sign, are found to be significant for all years while the human capital (EDU) variable is found to be positive and significant for 1996, 1998 and 2000.

In addition to the individual year estimates, the pooled GMM estimates from Table 2.6 also confirm the above results with the expected signs. In both models, the Hansen J test for over - identifying instruments are insignificant. Here, all the variables are significant for both models except for life expectancy (LE) and anticipated inflation (AI and AI1), which are significant in only one.

2.5.3 Implications of Empirical Results

This chapter's results provide evidence on the consistency of underlying theories to life insurance demand in developed countries from the demand for insurance literature.

As expected, anticipated inflation is positive and significant. This provides additional evidence supporting the theory that anticipated inflation affects consumer consumption patterns due to its effect on consumer confidence, in addition to its negative effect on savings through life insurance.

Life expectancy is significant and negatively related to life insurance demand. This confirms the hypothesis that average life expectancy represents the probability of death of the wage earner, thus leading to increased incentives for the protection of the dependents' future consumption. This is also consistent with the empirical results from Browne and Kim (1993), and Outreville (1996).

The negative significance of foreign market share supports the theory that foreign life insurer participation levels stem from an already competitive domestic market

and not from barriers to trade. Thus, lower levels of participation are a consequence of a lack of incentive for foreign companies to enter due to reduced profit-making opportunities. Thus, consistent with Browne, Chung and Frees (2000), the level of foreign market participation acts as a proxy for the price of insurance where *larger* foreign participation implies a less competitive market that leads to *lower* levels of life insurance demand. This theory is also noted by Outreville (1996), however, the dummy variable used to proxy the presence of foreign insurers did not have enough informational content to be able to provide any statistically significant evidence.

The results also show that income is significant and positively related to life insurance demand. This is consistent with Campbell (1980), Lewis (1989), Beenstock, Dickinson and Khajuria (1986) and Truett and Truett (1990), Browne and Kim (1993) and Outreville (1996). Thus, larger disposable incomes increase the affordability of life insurance protection, which consequently leads to greater life insurance consumption. In addition, a larger income also enhances the need for protection as the costs in terms of income forgone in case of an untimely death is now greater.

Consistent with Campbell (1980), Lewis (1989), Truett and Truett (1990), Browne and Kim (1993) and Outreville (1996), life insurance consumption has a positive relation with the number of dependents. This suggests that one of the main purposes of life insurance is to protect the household's dependents from premature loss of income. Consequently, this result verifies Lewis (1989) theory that a greater number of dependents increase the magnitude of family consumption, which in turn leads to increased life insurance consumption.

While other studies aside from Browne and Kim (1993) and Outreville (1996) have not yet explored how social security expenditure relates to life insurance demand using other samples, this chapter documents the negative significance of social security on life insurance demand using OECD countries, in contrast to the positive relationship that Browne and Kim (1993) find. This finding supports the hypothesis that for the more developed economies, social security expenditure acts as a proxy for national wealth as only wealthier countries can afford to have more generous programs since the source of social security would come from taxes. Since wealth acts as a substitute for the protection that life insurance offers (Lewis (1989) and Skipper and Klein (2000)), thus greater levels of social security expenditure leads to lower levels of life insurances consumption. Based on the results of Browne and Kim (1993), where both developing and developed countries are used, this result suggests that social security expenditure relates differently to life insurance demand depending on the stage of development of the country. As such, the positive relationship documented by Browne and Kim (1993) could be a reflection of the impact of social security expenditure for developing countries.

The impact of the human capital on demand for life insurance, as proxied by tertiary education GER is found to be positive and significant. The level of human capital thus affects the demand for life insurance via two ways. First, higher levels of education leads to greater awareness of the uncertainties of life as well as the increased ability to explore options to account for these uncertainties, such as life insurance. Coupled with increases in the level of risk aversion, as pointed out by Browne and Kim (1993) and Browne, Chung and Frees (2000), this leads to a greater incentive for protection via insurance, resulting in higher life insurance demand.

Finally, financial development is found to impact on life insurance consumption positively for all years. This strongly supports the theory that financial development leads to increased life insurance demand through the creation of a larger set of options for household financial investment as documented by Outreville (1990).

2.6 Conclusion

Over the last 10 years there has been significant growth in the demand for life insurance. Some work has already been done in investigating the demand for life insurance internationally and in developing countries but none have yet focused on demand in the more developed economies.

This chapter serves to fill that gap in research by investigating the demand determinants of total life insurance using OECD countries. In addition, several methodological improvements are made. A rational expectations approach to measuring anticipated inflation is innovated and used in addition to the GMM estimation technique to account for the inherent weaknesses found in normal ordinary least squares models used in prior studies (Outreville (1990, 1996), Browne and Kim (1993), Browne, Chung and Frees (2000)).

The results obtained provide several valuable contributions to our understanding of international life insurance demand and reconciles the literature from both life and non-life insurance. In terms of the more developed countries, anticipated inflation has a negative influence on the demand for life insurance. This result is also consistent with the literature on life insurance demand in developing countries

(Outreville (1996)) as well as internationally (Browne and Kim, (1993)). Thus, the results suggest that a higher level of expected inflation will lead to a decline a country's consumption of life insurance.

Other variables that have a negative influence on the demand for life insurance include life expectancy, foreign companies market share, and the level of social security expenditure. On the other hand, income, the dependency ratio, human capital and financial development are found to have a positive impact on life insurance demand. These results confirm the application of existing theory to the area of life insurance demand in the more developed OECD countries. In addition, the results suggest that the effect of social security on life insurance demand is different depending on a country's economic stage of development.

The results from this chapter have policy implications. Encouraging the continued financial development of the host country via supportive policies in skills improvement, transfers of technology and financial innovations that lead to increased alternative investment choices will lead to the accelerated development of the insurance industry. The negative relation of foreign market share to life insurance demand also indicates that for developed countries, the extent of foreign presence stems from the level of competitiveness of the domestic insurance market. This result suggests that by making domestic markets more competitive, host governments can increase the role of foreign insurers. The resultant benefits include increased trade linkages with other countries as well as greater product variety brought about through greater international diversification of risks by these companies.

However, further research is needed to establish if such will indeed be the case. To the extent that life insurance demand in this chapter is measured by *total* premiums per capita (USD), disaggregate data separating the foreign and domestic shares of total demand should be used to focus specifically on what will affect foreign participation alone.

Table 2.2
Cross – Country Estimates (Ordinary Least Squares)

Table 2.2 presents OLS estimates using the adaptive approach (AI) to measuring anticipated inflation, defined as the average inflation rate of the previous five years. Here, MSQ is a variable to control for the non – linearity of the foreign market participation variable.

	1996		1997		1998		1999		2000	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	85.4861	2.0158*	20.4952	0.4453	21.1041	0.3949	60.8731	1.5496	48.3625	1.2628
Anticipated Inflation (AI)	-0.0150	-0.8533	0.0014	0.0814	0.0058	0.3267	0.0031	0.1785	0.0271	1.2385
Life Expectancy (LE)	-22.6149	-2.1475*	-7.0701	-0.6279	-6.6305	-0.5169	-16.1258	-1.6748	-13.4405	-1.4280
Foreign Market Share (MS)	-0.3617	-1.0496	-0.5628	-1.6608	-0.9858	-1.3987	-0.2415	-0.3070	-0.8084	-0.9940
MSQ	0.0765	0.9034	0.1250	1.5573	0.2174	1.3985	0.0751	0.4616	0.1893	1.1140
Income (IN)	1.4782	3.1981***	1.7069	4.4042***	1.4715	4.1430***	1.5691	4.8483***	1.6769	5.2083***
Dependency Ratio (DR)	1.7926	2.18245**	0.5552	0.6142	0.8970	1.1261	1.0440	1.4594	1.3312	1.6280
Social Security (SS)	-0.0911	-1.0873	-0.0702	-0.8226	-0.1229	-1.5866	-0.1274	-1.6886	-0.1049	-1.2456
Human Capital (EDU)	2.0305	3.3853***	0.4470	0.4949	0.7453	0.9399	0.7486	1.3367	0.8502	1.4141
Financial Development (FD)	2.6869	3.9385***	1.1183	1.0690	1.4410	1.3088	1.6181	2.4432**	1.4336	2.1829**
Adjusted R Squared	0.8791		0.9094		0.9028		0.9044		0.8883	
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
LM Het Test	0.2988	0.5850	0.0846	0.7710	0.2174	0.6410	0.8158	0.3660	0.5607	0.4540
JB	0.1890	0.9100	0.1893	0.9100	2.7936	0.2470	0.1301	0.9370	0.3512	0.8390

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance
JB – Jarque-Bera test statistic for normality, LM – Lagrange Multiplier test for heteroscedasticity.

Table 2.3
Cross – Country Estimates (Ordinary Least Squares)

Table 2.3 presents OLS estimates using the forward-looking rational expectations approach (AI1) to measuring anticipated inflation, defined as the benchmark inflation rate (average inflation rate of the previous five years for 1983) and adjusted with changes in the short – term interest rate. Here, MSQ is a variable to control for the non – linearity of the foreign market participation variable.

	1996		1997		1998		1999		2000	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	57.2907	1.5910	12.5278	0.2816	-0.4956	-0.0090	53.5180	1.3757	49.8003	1.0214
Anticipated Inflation (AI1)	-0.0280	-2.4334**	-0.0096	-0.6850	-0.0054	-0.3986	0.0038	0.3238	0.0179	0.9053
Life Expectancy (LE)	-14.8693	-1.6112	-4.5097	-0.4084	-0.8947	-0.0672	-14.5970	-1.5400	-13.2447	-1.1312
Foreign Market Share (MS)	-0.4407	-1.6218	-0.5609	-1.8386*	-1.0962	-1.6685	-0.2054	-0.2193	-1.2992	-1.1225
MSQ	0.0864	1.2974	0.1234	1.7326	0.2408	1.6743	0.0842	0.4619	0.3135	1.4123
Income (IN)	1.1301	2.5882**	1.4751	3.5922***	1.2960	3.6803***	1.3330	4.6241***	1.3400	4.0217***
Dependency Ratio (DR)	1.1141	1.3968	0.0935	0.0983	0.3075	0.3469	1.5652	1.96196*	1.5120	1.6053
Social Security (SS)	-0.1567	-2.0466*	-0.0959	-1.1210	-0.1313	-1.7125	-0.1679	-2.26555*	-0.0944	-0.7582
Human Capital (EDU)	1.5999	2.8520**	0.2190	0.2418	0.2543	0.3008	1.6726	2.15629*	1.2245	1.3520
Financial Development (FD)	2.6268	4.4812***	1.0948	1.0578	1.0266	0.9047	1.8814	2.81608**	1.4073	1.9418
Adjusted R Squared	0.9052		0.9093		0.9022		0.9344		0.9107	
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
LM Het Test	0.0000485	0.9940	0.0992	0.7530	0.1440	0.7040	1.6639	0.1970	1.3356	0.2480
JB	1.1436	0.5640	0.1785	0.9150	2.5440	0.2800	0.8603	0.6500	0.6156	0.7350

*

Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance
JB – Jarque-Bera test statistic for normality, LM – Lagrange Multiplier test for heteroscedasticity.

Table 2.4
Cross – Country Estimates (Generalized Method of Moments)

Table 2.4 presents GMM estimates using the adaptive approach (AI) to measuring anticipated inflation, defined as the benchmark inflation rate (average inflation rate of the previous five years for 1983) and adjusted with changes in the short – term interest rate. Here, MSQ is a variable to control for the non – linearity of the foreign market participation variable.

	1996		1997		1998		1999		2000	
	Estimate	t-stat	Estimate	t-stat	Estimate	stat	Estimate	t-stat	Estimate	t-stat
Intercept	105.8300	9.9563***	5.2767	0.4422	37.4191	1.5850	66.5428	3.0953***	52.7260	3.1478***
Anticipated Inflation (AI)	-0.0736	-20.5469***	-0.0005	-0.0439	-0.0006	-0.0617	-0.0028	-0.4278	0.0140	1.2621
Life Expectancy (LE)	-24.7455	-9.1879***	-3.3403	-1.2970	-10.5007	-1.8234*	-17.2844	-3.2917***	-14.0540	-3.3609***
Foreign Market Share (MS)	0.0613	1.6025	-0.7227	-5.6678***	-0.8464	-3.4079***	-0.0102	-0.0217	-0.9096	-2.0700**
MSQ	-0.0257	-2.2002***	0.1708	6.5373***	0.2057	4.0942***	0.0277	0.2735	0.2208	2.2737**
Income (IN)	0.6469	5.4506***	1.6974	10.8302***	1.4783	9.3732***	1.4948	12.1889***	1.5500	8.3040***
Dependency Ratio (DR)	0.4132	3.8067***	0.3337	1.6598*	1.0788	2.7369***	1.1022	3.0208***	1.5120	3.3326***
Social Security (SS)	-0.2072	-6.5472***	-0.0670	-1.5968	-0.1718	-5.5014***	-0.1494	-3.2899***	-0.1749	-3.2426***
Human Capital (EDU)	1.3765	13.7243***	0.1708	0.8443	0.9911	2.5123**	0.7908	2.1419**	0.9393	2.7591***
Financial Development (FD)	2.8991	85.7842***	0.7660	2.6224***	1.6865	3.4425***	1.8568	4.8060***	1.6484	4.1670***
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
HJ Test	14.2726	0.1610	9.6359	0.4730	6.6909	0.4620	2.8697	0.8250	13.0763	0.1090

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance
HJ test – Hansen J test for over identifying instruments.

Table 2.5
Cross – Country Estimates (Generalized Method of Moments)

Table 2.5 presents GMM estimates using the forward-looking rational expectations approach (AI1) to measuring anticipated inflation, defined as the benchmark inflation rate (average inflation rate of the previous five years for 1983) and adjusted with changes in the short – term interest rate. Here, MSQ is a variable to control for the non – linearity of the foreign market participation variable.

	1996		1997		1998		1999		2000	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	67.3584	3.8305***	12.6306	1.4718	32.0425	1.5707	34.1482	0.8231	35.3321	1.9533*
Anticipated Inflation (AI1)	-0.0287	-5.2465***	-0.0083	-6.0064***	-0.0009	-0.4748	-0.0007	-0.1964	0.0018	0.4507
Life Expectancy (LE)	-17.3561	-3.9001***	-4.6623	-2.1711**	-9.1669	-1.8514*	-9.3926	-0.9330	-9.4042	-2.1668**
Foreign Market Share (MS)	-0.5412	-7.5351***	-0.6682	-11.4918***	-0.9812	-4.0735***	-0.5744	-1.3391	-1.4234	-4.5850***
MSQ	0.1017	5.1672***	0.1559	13.7246***	0.2351	5.0200***	0.1641	1.8326*	0.3317	5.1707***
Income (IN)	1.1617	5.7461***	1.5507	17.6383***	1.5207	19.9438***	1.4102	11.214***	1.4471	10.7667***
Dependency Ratio (DR)	1.9684	5.5482***	0.3609	1.9165*	0.7371	2.6305***	0.7791	1.3627	0.9591	2.2401**
Social Security (SS)	-0.1373	-6.6402***	-0.0829	-4.8001***	-0.1421	-6.4071***	-0.1285	-3.2515***	-0.2056	-4.4524***
Human Capital (EDU)	1.8829	6.5656***	0.1910	1.0549	0.6384	2.0455**	0.4709	0.8834	0.5710	2.1157**
Financial Development (FD)	2.7352	8.9817***	0.9201	4.1920***	1.2549	2.9564***	1.2638	1.7676*	1.2061	3.1338***
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
HJ Test	14.5038	0.1050	7.2267	0.7040	7.2258	0.406	9.7423	0.1360	10.5204	0.23

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance
HJ test – Hansen J test for over identifying instruments.

Table 2.6
Pooled Cross – Country Estimates

Table 2.6 presents both pooled OLS and GMM estimates using both the adaptive approach to measuring anticipated inflation (AI), and the rational expectations approach (AI1). Here, MSQ is a variable to control for the non – linearity of the foreign market participation variable.

	Ordinary Least Squares				*Generalized Method of Moments*			
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	16.9599	1.0231	16.0248	1.0063	28.5392	1.6090	21.1511	1.0210
Anticipated Inflation (AI)	-0.0058	-0.7566			-0.0067	-0.6693		
Anticipated Inflation (AI1)			-0.0205	-3.6958***			-0.0241	-2.6508***
Life Expectancy (LE)	-5.1673	-1.2847	-4.3724	-1.1160	-8.0524	-1.8810*	-5.4817	-1.0535
Foreign Market Share (MS)	-0.4865	-2.7604***	-0.5178	-3.2660***	-0.4214	-3.4811***	-0.4894	-4.2226***
MSQ	0.1162	2.8523***	0.1259	3.4782***	0.0996	3.4087***	0.1182	4.4409***
Income (IN)	1.0964	8.1053***	0.9083	7.1260***	1.2414	9.5895***	0.9132	5.6951***
Dependency Ratio (DR)	1.1924	3.5310***	0.7324	2.0823**	0.9678	2.4233**	0.3424	0.7353
Social Security (SS)	-0.1363	-3.9048***	-0.1799	-5.2985***	-0.1438	-5.5579***	-0.1771	-7.3283***
Human Capital (EDU)	1.1286	4.2023***	0.9935	3.5241***	0.9709	2.5314**	0.8137	2.0987**
Financial Development (FD)	2.0777	6.9411***	2.0577	7.1084***	1.9379	4.5703***	1.8897	4.9255***
Adjusted R Squared	0.8859		0.9035					
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
LM Het Test	8.9241	0.0030	9.8550	0.0020				
JB	5.1698	0.0750	1.1494	0.5630				
Hansen J Test					5.1632	0.3960	7.6735	0.175

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance.
JB – Jarque-Bera test statistic for normality; LM – Lagrange Multiplier test for heteroskedasticity; HJ test – Hansen J test for over identifying instruments.

Table 2.7
Correlation Matrix of Explanatory Variables

Table 2.7 presents the correlation matrix of the independent variables for the detection of severe multicollinearity in the data.

	AI	AI1	LE	MS	IN	DR	SS	EDU	FD
AI	1.00								
AI1	0.72	1.00							
LE	-0.74	-0.66	1.00						
MS	-0.07	-0.18	0.19	1.00					
IN	-0.77	-0.71	0.84	0.10	1.00				
DR	0.20	0.17	-0.32	-0.11	-0.43	1.00			
SS	-0.68	-0.75	0.69	0.25	0.71	-0.24	1.00		
EDU	-0.51	-0.48	0.49	-0.05	0.47	-0.52	0.30	1.00	
FD	-0.43	-0.35	0.56	0.30	0.60	-0.46	0.60	-0.08	1.00

Appendix 2A: *Subsidiary Tests Using Control Variables*

As a check for robustness, additional tests are done using dummy variables controlling for EU membership and the presence of a monopolistic market.

Given that the sample of OECD countries is strongly inclined toward EU member countries, a dummy designating 1 for EU member and 0 otherwise is added into the demand for life insurance model. As of 2004, the number of EU members total 25, out of which 18 are included in this chapter's sample. With increased levels of deregulation among EU members, the addition of this variable allows us to identify if the higher level of financial freedom between member countries has any significant impact on domestic life insurance demand.

In addition to the EU dummy, a control variable that accounts for the level of competition in the market is added. Summing the squared market shares of individual insurers in each country and multiplying the result by 10,000 calculate the Herfindahl Index (this variable is further used in Chapter Three). For a perfectly monopolistic market, the HI index obtained would be 10,000. The Herfindahl Index (HI) used here is based on the National Association of Insurance Commissioners' criteria for defining a competitive marketplace. Accordingly, HI levels greater than 1800 are classified as monopolistic and assigned a dummy value of 1.

Adding these variables, the subsidiary tests results are consistent with the findings obtained in Chapter Two, with both the control variables returning significant results.

The positive significance of the EU dummy variable confirms that the greater level of financial freedom between EU countries has a positive impact on the level of life

Pooled GMM Cross-Coutnry Subsidiary Estimates

Results are based on both the adaptive measure of anticipated inflation (AI), and the rational expectations measure (AI1). MSQ is used to control for the non-linearity of the MS variable.

	Generalized Method of Moments			
	Estimate	t-stat	Estimate	t-stat
Intercept	31.4214	1.6786*	10.5364	0.5891
Anticipated Inflation (AI)	-0.0361	-2.0462**		
Anticipated Inflation (AI1)			-0.0502	-6.4717***
Life Expectancy (LE)	-7.4019	-1.6824*	-1.6465	-0.3737
Foreign Market Share (MS)	-0.6315	-4.6296***	-1.0358	-5.6052***
MSQ	0.1202	3.8858***	0.2085	5.5302***
Income (IN)	0.8737	3.9726***	0.5094	4.1986***
Dependency Ratio (DR)	0.2486	0.6088	0.6995	-1.7228*
Social Security (SS)	-0.2354	-6.8440***	-0.2500	-8.9983***
Human Capital (EDU)	0.6145	1.7687*	0.4171	1.2948
Financial Development (FD)	1.7547	5.1761***	1.4643	4.2358***
Herfindahl Index (HI)	-1.0098	-2.6511***	-1.4063	-4.1823***
European Union Dummy (EU)	0.3431	2.5384**	0.4585	2.2189**
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*
Hansen J Test	8.7782	0.1180	8.9869	0.1100

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significnace, HJ test – Hansen J test for over identifying instruments.

insurance demand. This potentially stems from the greater ease for which Additionally, the Herfindahl Index (HI) variable is negatively significant, implying that a monopolistic market has a negative impact on life insurance demand, likely

arising from higher prices as predicted by traditional economic theory. This is consistent with the negative significance of the foreign market share variable (MS), which confirms the theory that the size of foreign insurers' share in the domestic market stem from the underlying level of competition in the market and the consequent price impact of this competition on life insurance demand.

CHAPTER 3

FOREIGN PARTICIPATION IN LIFE INSURANCE MARKETS

3.1 Introduction

The subject of foreign participation in life insurance markets can be viewed in terms of category two in GATS as presented in Moshirian (2004) (movement of providers only). With the continued push for liberalization from the Uruguay Round of Trade Negotiations and the furthering of the GATS agreements, cross-border investments involving the movement of providers are becoming increasingly important within international trade in financial services. Factors influencing foreign participation are thus becoming especially relevant to trade in international insurance services in light of the rapid internationalization and deregulation as advocated by international agencies such as the WTO and OECD. The establishment of the Third Non-Life Directive and the Third Life Directive by the Council of European Communities has also resulted in the rise of cross-border trade in insurance services within the European Union. Similarly, increased deregulation within the Asian financial markets have led to greater foreign insurer participation in these markets, especially within the life insurance sector. (Swiss Re, Sigma, 2002, No 7, pg 25). The results of

Cummins and Santomero (1999) that find an overall benefit in efficiency resulting from the consolidation within the U.S. life insurance industry suggests similar motivating reasons for cross-border Mergers and Acquisitions (M&A) activity by foreign insurers. The authors document greater efficiency gains in firms that have been acquired over those that have not been involved in any M&A activity.

Recent developments in bancassurance have also contributed to the fast growth in the life insurance sector.[19] For example, banks deal with over 60 percent of life insurance business in France, Portugal and Spain and handle 15 percent and 24 percent of business in the life insurance sector in Hong Kong and Singapore, respectively (Swiss Re, Sigma, 2002, No. 7). Compared to non-life insurance, life insurance products are more easily associated with banking products for several reasons. Firstly, life insurance and bank products are complementary, both of which involve asset accumulation and management. Secondly, banks' can leverage off their detailed knowledge of customers' financial needs and large customer base to facilitate the sale of life insurance products. Thirdly, potential synergies exist in bancassurance, namely, cost savings and product packaging that increase the usefulness and attractiveness of these products to the investment needs of consumers. These benefits in turn help to foster a broader and deeper financial marketplace, which provide a better base for economic development. With the increased need for countries to remain competitive, foreign participation in international financial services also represents an important source of funds for developing countries and a means of diversification for the larger corporations in developed nations.

[19] According to Swiss Re, Sigma, (2002, No. 7, p5), bancassurance is defined, in its simplest form, as the distribution of insurance products by banks.

In a recently published article, Ma and Pope (2003) look at the determinants of foreign non-life insurance taking into account market structure variables. They find that the level of competition in the market, profitability and interest rates are significant factors that attract foreign insurers' participation. Currently, the majority of research done in the area of foreign participation focuses on manufacturing and multinational banking. This chapter provides an essential starting point in exploring how underlying theories on the international expansion of banks can be applied to insurance companies, and to life insurers in particular.

In light of current literature, this chapter presents several significant contributions. Despite the huge amount of work already done in the area of demand and supply of insurance services, only one paper (Ma and Pope (2003)) has looked at the area of foreign participation in domestic non-life insurance markets. Thus, this chapter is the first study to look at foreign participation in life insurance markets and enhances our knowledge of what drives foreign insurance participation vis-à-vis socio-economic and market structure variables. Thus, this chapter has useful policy implications of for host insurance regulators, and makes useful additions to the literature about the demand and supply of insurance services. This chapter also extends on the findings of Chapter Two by using disaggregate data that separate foreign insurers from domestic insurers. Given that much of the motivation and consequences of FDI in insurance services remain to be understood[20], this chapter adds to the work done in the area of FDI and provides supporting evidence for some of the reasons motivating foreign insurers' participation. In addition, several improvements are made to Ma

[20] See for example, Moshirian (1997 and 1999).

and Pope (2003). Socio-economic control variables from Chapter Two are added from the literature on life and non-life insurance demand. Methodological improvements are also made via the use of the GMM estimation technique to take into account deficiencies inherent in the data such as endogeneity, measurement errors, multicollinearity and heteroscedasticity.

The results reveal that the level of openness and liberalization of the domestic economy is more important than the underlying level of competition in influencing foreign participation levels. This contrasts with non-life insurance markets, where the level of competition in the domestic insurance market is instead found to be more important (Ma and Pope (2003)). Thus, a potential source of comparative advantage in international insurance services lie with market liberalization measures. This chapter also finds that the level of competition in the market rather than market openness influences domestic participation, unlike foreign participation. Additional variables like foreign market share, income, social security expenditure, human capital endowment and the level of financial development, are also found to explain variations in both foreign and domestic insurer participation levels.

Chapter Three is structured as follows: Section 3.2 presents an overview of the literature in foreign participation with a focus on insurance and multinational banking. Section 3.3 presents the hypothesized variables used in this chapter. Data used in this chapter together with the methodology are outlined in Section 3.4. Finally, Section 3.5 presents the empirical results and their implications, with Section 3.6 rounding up with this chapter's conclusions and agenda for further research.

3.2 Literature Review

Within the context of international trade in insurance services, existing literature has documented the determinants of comparative advantage of both insurance and other services (Sapir and Lutz (1981)). The investigation of the determinants of foreign participation in life insurance markets is thus an important contribution to our understanding of what creates potential sources of comparative advantage. This confirms the existence of intra-industry trade (IIT) in insurance services[21], consistent with the findings of Li et al. (2003) and documents the seemingly surprising existence of foreign life insurance penetration in some of the most developed insurance nations, such as the US, Switzerland and the UK.[22] Recent developments in IIT theory may explain this phenomenon, including the increased product differentiation between foreign and domestic life insurance services, similar consumer tastes for life insurance products between domestic and foreign countries, greater international interactions through FDI, and deeper insurance markets from globalization in the insurance industry worldwide.

To date, there has been extensive work done in theories regarding foreign direct investment especially in the area multinational banking (Yamori (1998), Claessens et al (2001)), and with some attention on international insurance services (Skipper

[21] According to Li et al. (2003), IIT in insurance occurs when a country simultaneously exports and imports insurance services.

[22] According to the traditional theory of Heckscher, Ohlin and Samuelson (H-O-S theory), comparative advantage is due to differences in each country's allocation of capital and labor. Thus more advanced countries will export products with comparative advantage and import products with comparative disadvantage.

(1987), Skipper (1996) and Skipper and Klein (2000)). This section is not meant to be a treatise on the latest developments in FDI theory however; some of the more important and relevant aspects of these theories will be highlighted. Included are the role and importance of foreign participation to the banking and insurance sector, as well as the determinants that potentially serve to attract foreign entry. These allow us to place into context some of the motivating factors and influences that lead to international insurers' overseas expansion as well as the determinants that lead them to undertake such investments.

3.2.1 Role and Importance of Foreign Participation

The level of foreign participation has implications across many different areas relating to a country's well being. Increased levels of foreign participation would lead to transfers in knowledge and technology, culminating in increased efficiency. Skipper (1987) analyzes the nature of protective barriers to international trade in insurance and finds that many countries impose trade barriers and restrictions to protect local industries from foreign competition. The result according to economic theory would be less market competition and higher prices. Entry of foreign multinational companies will thus increase the level of competition in the domestic market through offering lower priced products by virtue of its' ability to affect cost savings from its access to international markets. This would result in increased quality and quantity of financial products offered via both direct offerings by foreign institutions and by domestic companies through competition, leading to greater consumer welfare. This view is consistent with Goldberg and Saunders (1981a),

Walter and Gray (1983) and Gelb and Sagari (1990), who emphasized the increased efficiency in resource allocation from the entry of foreign banks. In addition, Claessens et al (2001) finds that increased participation by foreign banks was related to decreasing profitability and diminishing overhead expenses in domestic banks as well as in 80 countries for the period between 1988-1995[23]. Levine (1996) also postulates that the entry of foreign banks is likely to have positive effects. He notes that this would derive from more sophisticated services as well as the provision of products and services to market niches. This would lead to increased competition, improved financial skills and technology, and a strengthening of the legal and regulatory framework of the host country.

For the insurance industry and in terms of the international insurance establishment trade, the entry of foreign participants will bring capital, expertise, and strategic benefits to the host country since insurance companies have a lot of funds that can be channeled into certain target industries thereby stimulating the development of a country (subject of course to certain liquidity, security and risk spread criteria). In addition, increased foreign participation will result in a better working of the mutualization process, which takes place when the burden of the few losses is spread amongst the many. Thus, foreign insurers are able to define a much larger insurance pool than domestic insurers, thereby taking advantage of geographical diversification benefits. In doing so, they potentially broaden and deepen the financial market of the host country by introducing innovative approaches to the marketing of financial products and services, thus providing opportunities for investors to adjust their risk profiles given a larger set of financial alternatives. This leads to a greater capacity for

[23] Demirgguc-Kunt and Huizinga (1999) also document similar results.

insurance in the host country, which consequently increases its capacity to take more risks. The net effect of this would be an accentuation in the amount of benefits that insurance brings to a country's economy including increased financial stability, the facilitation of trade and commerce, risk management, loss mitigation and more efficient capital allocation (Skipper and Klein (1996 and 2000)).

Aside from some of the benefits that may arise from increased foreign participation in insurance, there are however potentially deleterious effects from an increased foreign presence. One of these involves the fact that insurance companies play an important strategic role in terms of a country's economic development as insurance companies have a lot of funds that can be channeled into certain target industries. In addition, increases in foreign participation in insurance provide additional avenues for capital flight from domestic markets during periods of crises. Thus, the governments of certain countries might deem it strategically important for the control over these funds to be under the stewardship of local companies. Another common concern in admitting foreign participants into domestic insurance industries include excessive foreign exchange outflows that could be a potentially be a point of weakness in the stability of the domestic financial market. Such movements of 'hot' money by large foreign insurers could contribute to increased vulnerability in the face of economic crises, as was the case in the 1997 Asian financial crisis.

3.2.2 Determinants of Foreign Participation

Some of the drivers that influence whether foreign companies enter into a market include defensive reasons such as the 'follow-the-client' mentality, host market

opportunities, entry and trade restrictions and regulations including tax treatments. In light of the growing importance of insurance to the financial services industry, this section will briefly review the main factors that influence the level of foreign participation in domestic financial services markets.

3.2.2.1 Foreign Participation and International Financial Services

Existing literature in the area of foreign investment in insurance is sparse at best. Moshirian (1994b) documents that trade in financial services are not dissimilar to trade in goods. Following, Moshirian (1999a) finds that the deregulation of international financial markets, coupled with advances in communications technology, have resulted in the significant growth of trade in financial services. Thus, advances in international trade in insurance would result in increased economic growth via the increased efficiency and sophistication of more liberalized financial markets. In another study on FDI in insurance services in the U.S., Moshirian (1997) analyzes the determinants of FDI in insurance services and conclude that the demand for insurance services as well as the size of the insurance sector of the source country is the main factors that influence the level of FDI in insurance.

Apart from the few studies done in the area of trade in international insurance, most of the work done on foreign participation relates to the role of multinational banking. In this regard, two main theories have developed to explain the internationalization of banks. The internalization theory focuses on the advantages that accrue to multinational banks due to its ability to limit the cost of market failures by carrying

out a share of their transactions within the boundaries of the firm. The other theory that has proven to be widely used in the banking literature to understand the expansion of the multinational bank is the eclectic theory by Dunning (1977). Here, three advantages are identified in explaining FDI distribution, including location-specific, ownership-specific and internalization advantages.

3.2.2.2 Location-Specific, Ownership-Specific and Internalization Advantages

Location-specific advantages generally refer to the extent to which firms choose to locate activities outside of their own national boundaries. These advantages are in turn a product of the underlying characteristics of the host country that reflect local opportunities for foreign firms to exploit. With reference specifically to the insurance industry, these host country opportunities encompass a wide variety of factors including differences in the level of human capital available, the insurance opportunity in the host country, level of underlying competition in the market and regulatory differences pertaining to international trade in insurance products. Ownership-specific advantages on the other hand, deal with factors relating to how *competitive* foreign firms are relative to domestic firms taking into account the natural disadvantages to the foreign firm in terms of having to operate in a new and unfamiliar environment. In the case of multinational banks and applicable to insurers given their similar functions as financial intermediaries, ownership-specific advantages would mainly derive from availability of financial and human resources, the possession of superior and unique managerial techniques, extensive experience, skilled personnel, organizational skills, and a large domestic capital and deposit base (Yannopoulos (1983) and Aliber (1984)). Finally, there are internalization advantages

that stem from the need by firms to internalize the markets for their own products and services in order to gain competitive advantages. Factors included here are mainly information driven (Williams (1997)), and are especially important in banking and in insurance particularly.

Thus, under these contexts, the pattern of the expansion of multinational financial institutions can be explained, including why multinational banks' ventures involve cross-border investment, the comparative advantage essential for foreign banks to have over incumbent rivals, as well as how these multinational banks can exploit and create these advantages using resources located within and outside its own boundaries[24].

Due to data restrictions, most of the empirical work done so far has focused on location-specific advantages involving gains to the bank operating within a host country. These are derived from either location-specific push or pull factors, depending on where the *source* of the benefit is derived. Examples include the size of the host market, trade relations, less restrictive entry and other regulations and lower country risk. Among ownership-specific advantages are product diversification, superior skills and human capital and information systems, while examples of internalization advantages include availability and cost of fund transfers within the multinational banks, efficient customer contacts, transfer pricing manipulation, improved networks for information gathering and potentially reduced earnings volatility. This chapter deals with location-specific *pull* factors that attract foreign

[24] For a more detailed account of the Eclectic Theory and others, please refer to Dunning (1977) and Williams (1997).

participants in insurance and as such, here only location-specific pull factors are elaborated upon.[25]

3.2.2.3 Location-Specific Pull Factors

In the area of location-specific advantages, existing literature has numerous studies that document a positive relationship between FDI in banking and the level of integration between the home and host countries. This occurs when banks seek new markets and comparative advantages by following clients to foreign countries in which they operate. Benston (1990), Gray and Gray (1981) and Grubel (1977) identify three sources of comparative advantage in their study of overseas expansion. These include additional business from home country clients with businesses in the host country, potential host country clients that have businesses in the home country (here, the comparative advantage stems from the bank being more familiar with the home environment in offering services to foreign clients), and finally from ownership-specific advantages such as product and geographic diversification (Yannopoulos (1983)). Goldberg and Saunders (1980) and (1981), Goldberg and Johnson (1990), Grosse and Goldberg (1991), Brealey and Kaplanis (1996), Yamori (1998) and Buch (2000) all examine the relationship between bank FDI and economic integration. In the above cases, this has been measured using either bilateral trade or financial and non-financial FDI.

Other determinants for foreign bank participation include location-specific pull factors that offer opportunities in the host country. Yamori (1998) examines the

[25] For more on location-specific pull factors see Clark et al (2001) and Sturm and Williams (2002).

location choice of Japanese banks and finds evidence that local banking opportunities proxied by GDP per capita are significant in influencing Japanese banking presence. In terms of profitability, Claessens et al (2001) find that in developing countries, foreign banks tend to have higher profits than domestic banks and vice versa for developed countries. This could stem from ownership-specific comparative advantages as mentioned previously such as superior human capital in the form of experienced personnel, enabling greater product innovation and product diversification, as well as from systematic differences between foreign and domestic banks, such as different regulatory and tax regimes, customer bases and procedures. In addition, developing countries would generally offer more profit opportunities due to lower efficiency and competition. This is found to be the case in Demirguc and Huizinga (1999), where bank level data for 80 countries reveal that lower market concentration ratios lead to lower bank margins and profits. On the other hand, for the case of bank participation in developed countries, the ownership-specific comparative advantages that foreign banks possess might be mitigated somewhat by a more developed, sophisticated and competitive host economy, thus reducing the profitability of foreign banks as found in Claessens et al (2001).

The impact of the level of regulation in the host country is important in affecting the attractiveness of the host economy to foreign participants. Prior literature has documented the importance of regulation on foreign banks (Brimmer and Dahl (1975), Goldberg and Saunders (1981a and 1981b)). From international trade theory, the impact of regulations by the host country on foreign entry are clear – such restrictions serve to protect domestic infant industries from foreign competition in the initial stages until a time such that these industries are able to compete efficiently.

However, reality would sometimes have it otherwise, since once implemented, political entrenchment potentially sets in[26], thus posing an obstacle to their removal once these industries develop, leading to inefficiency. The immediate impact of these regulations would obviously be a negative reaction to the level of foreign participation. Barth, Caprio and Levine (2001) find that tighter restrictions on foreign entry into banking are positively related to the fragility of banks. In addition, they find that these restrictions also correlate to higher overhead costs. These results corroborate the above theory as to the vulnerability of incumbent firms due to inefficiency arising from protectionist policies.

Together with the literature on foreign participation, this chapter also incorporates variables from the demand for insurance literature and hypothesizes that these variables do serve to attract foreign entry in light of their relationship to the local insurance opportunity of the host country. Chapter Two has already established the importance of these variables in explaining cross-country demand for life insurance. The following section outlines these variables hypothesized to be location-specific factors in attracting the foreign participation of life insurers.

[26] Skipper and Klein (2000) suggest that one possible reason for the existence of regulation might be more for protecting established private interests instead of the wider public national interest.

3.3 Factors Governing Foreign Participation in Life Insurance Markets

Chapter Two documents that location-specific variables such as life expectancy, social security expenditure, income, dependency ratio, anticipated inflation, human capital, financial development and foreign market share are significant in explaining the level of *total* life insurance demand in OECD countries. This chapter builds upon that work by separating out total life insurance demand into domestic and foreign insurance companies since it is conceivable that the hypothesized relationships in Chapter Two between these socio-economic factors and total life insurance demand is different for foreign insurance companies and domestic insurance companies. This could stem from the fact that foreign insurance companies price their products using a more diversified customer base across the different countries in which they operate. Thus, foreign participation in this case will be affected by the different socio-economic and market structure factors across the countries in which the foreign insurance company operates, as opposed to domestic insurance companies, which are confined to the socio-economic and market structure factors in their domestic country. Consistent with Ma and Pope (2003), this chapter uses premiums per capita in USD as a proxy for the level of foreign participation.

The following factors are hypothesized to influence how desirable a host country is to foreign life insurance providers. In some sense, these variables model the potential size of the insurance sector in the host countries from the perspective of foreign insurers and hence reflect size of the insurance opportunity in host countries. This is consistent with the banking literature on foreign entry where studies have established the importance of the local banking opportunity as a factor in attracting foreign

banks[27]. Moshirian (1997) also finds that the size of the source country's insurance sector is positively related to FDI in insurance in the U.S.

3.3.1 Socio – Economic Factors

This section briefly outlines the socio-economic factors that govern the level of foreign participation in OECD countries. For a more detailed account as to their theoretical underpinnings, please refer to Chapter Two, Section 2.3.

The level of anticipated inflation is expected to influence the level of foreign participation in a manner consistent with Fortune (1973), Cargill and Troxel (1979), Browne and Kim (1993) and Outreville (1996). Thus, it is expected that anticipated inflation be negatively related to the level of foreign participation. This stem from the potential effects arising from changes in the consumption pattern of life insurance products as well as declines in consumer confidence (Fortune (1973) and Cargill and Troxel (1979)). For comparability with prior literature (Outreville (1990, 1996) and Browne and Kim (1993), this chapter uses the adaptive measure of anticipated inflation as defined in Chapter Two (i.e. defined as the average inflation rate over the previous five years).

[27] Goldberg and Saunders (1981), Gray and Gray 91981), Yannopulos (1983), Aliber (1984), Moshirian (1986), Nigh, Cho and Krishnan (1986), Goldberg and Johnson (1990), Grosse and Goldberg (1991) and Yamori (1998).

It is also hypothesized that the average life expectancy of residents in the domestic country will affect the level of foreign participation, however the direction of this influence is not known. A lower life expectancy could lead to increases in the need for protection (Browne and Kim (1993)), however, should life expectancy proxy the actuarially fair price of insurance (Outreville (1996)), then a longer life expectancy will reflect a lower price of insurance and consequently a greater demand for life insurance. This result has been verified in Chapter Two for total life insurance demand. Separating domestic from foreign insurers, this chapter seeks to find if this relationship still holds for attracting foreign insurer participation.

Current literature has established the importance of income in determining the level of insurance demand (Hakansson (1969), Fischer (1973), Fortune (1973), Campbell (1980), Lewis (1989), Beenstock, Dickenson and Khajuria (1988), Truett and Truett (1990), Browne and Kim (1993), Outreville (1996) and Ma and Pope (2003)). This stems from a higher disposable income leading to greater demand for life insurance, which in turn results in greater insurance market potential. In addition, Moshirian (1999a) documents the importance of income in explaining outward FDI in insurance from Germany and the U.K. Thus, it is expected that income will have a positive relationship with foreign participation levels, as greater life insurance demand will result in more incentives for foreign companies to enter a domestic market. Here, as in Chapter Two, per capita GDP in USD is used as a proxy for income.

According to Beenstock, Dickinson and Khajuria (1986), Browne and Kim (1993) and Outreville (1996), the level of a country's dependency ratio proxy's a higher present value of the family's consumption and hence a greater need for protection.

This chapter hypothesizes that the relationship between foreign life insurance participation is positively related to the dependency ratio, where the dependency ratio is taken as the ratio of under 15 and over 64, to the working age population aged between 15-64 years.

Following Lewis (1989) Browne and Kim (1993) and Skipper and Klein (2000), social security expenditure could have a substitution effect to insurance arising from the protective function accorded to wealthier countries (here, countries with large social security expenditures are reflective of these wealthier economies). However, the *a priori* relationship cannot be ascertained as social security expenditure could also represent an increased ability to purchase, as well as a greater need for life insurance (Browne and Kim (1993)). To measure social security expenditure, per capita public social expenditure in USD is used.

The level of education of a country's population is representative of the amount of human capital endowment of the country. Consequently, this reflects a greater level of risk aversion that results in an increased awareness of the need for protection via life insurance (Browne and Kim (1993), Browne, Chung and Fees (2000)). Thus, human capital is expected to have a positive relationship with foreign insurers' life insurance consumption and is measured by the level of tertiary education tertiary GER[28] from *UNESCO*.

[28] Gross Enrolment Ratio. The formula used is as defined in Chapter Two, Section 2.3.7.

3.3.2 Market Structure Factors

In addition to the above socio-economic factors, this chapter incorporates market structure variables such as foreign market share and the level of financial development, as well as two other variables consistent with Ma and Pope (2003).

Chapter Two provides evidence that foreign insurers market share has a negative relationship with total life insurance demand. This suggests that for total life insurance demand, the underlying level of competition in the domestic market determines foreign market share. In this chapter, domestic and foreign participation are separated with the purpose being to investigate their individual foreign market share effects. This chapter hypothesizes that the relationships between domestic business and foreign market share, and foreign participation and foreign market share can be either positive or negative. A greater foreign market share may be due to a higher level of openness in the domestic economy, resulting in lower insurance prices. This would result in a positive relationship between foreign participation and foreign market share. On the other hand, if the level of foreign market share represents the underlying level of price competition in the market, then foreign market share will have a negative relation to foreign participation levels since the more competitive life insurance prices results in greater life insurance consumption and less incentives for foreign market entry. As with Chapter Two, foreign market share is defined as the market share of foreign controlled undertakings and branches and agencies of foreign undertakings to total domestic business on a gross premiums basis.

The level of financial development can also influence the level of foreign participation. Outreville (1990 and 1996) establishes the importance of financial development to insurance consumption. In addition, from the banking literature, Yamori (1998) suggest the development of the banking sector is important to the location choice of Japanese banks and use M2 to GNP per capita as a proxy banking opportunity. The accessibility to large and developed financial centers is also shown to be important in attracting foreign banks (Brealey and Kaplanis (1996) and Buch (2000)). This chapter hypothesizes that financial development is positively related to domestic and foreign participation levels and uses the definition consistent with Outreville (1990, 1996), where the ratio of M2 to GDP is used as a proxy for financial deepening.

The level of market liberalization will impact upon foreign participation levels as it represents the barriers related to trade in international insurance services. The importance of the regulatory environment in attracting foreign participants is well established in the banking literature[29]. Following Ma and Pope (2003), this chapter uses the International Business Climate (IBC) index by the Political Risk Services Group as a measure of market liberalization[30]. The level of liberalization of a country is gauged on a scale of 0 to 100, where a score of 100 denotes the most favourable climate for doing business. This provides a useful indicator of market liberalization since a large portion of the 17 variables included in the IBC index address restrictive

[29] Brimmer and Dahl (1975), Kelly (1977), Goldberg and Saunders (1981a and 1981b) and Barth, Caprio and Levine (2001).

trade policies. Here, the IBC variable is expected to show a positive relationship with the level of foreign participation since countries with lower barriers to trade and a more liberalized environment will tend to attract more foreign insurers.

In addition to market liberalization, this chapter also incorporates a variable that accounts for the level of competition in the market. Ma and Pope (2003) find that a more competitive non-life insurance market results in greater foreign insurers' premium levels. This chapter hypothesizes that for life insurance markets, the same relationship should hold and that a more competitive environment will lead to greater foreign participation levels. This is likely since a more competitive market is a reflection of a more conducive and efficient business and regulatory environment. Here, the Herfindahl Index[31] is used to measure the level of competition. In this chapter, following the National Association of Insurance Commissioners' (NAIC) criteria for defining a competitive marketplace, HI measurements greater than 1800 are classified as non-competitive and a dummy value of 1 is assigned. Thus, it is hypothesized that there is a negative relationship between the Herfindahl Index and foreign participation levels.

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[30] The IBC index consists of trade related components such as such as restrictions on equity, restrictions on local operations, taxation discrimination, exchange barriers, tariff and non-tariff barriers, payment delays, restrictions on foreign trade and labour costs.

[31] Summing the squared market shares of individual insurers in each country and multiplying the result by 10,000 calculate the Herfindahl Index. For a perfectly monopolistic market, the HI index obtained would be 10,000. Here, due to data limitations, either the binary characterization of the latest year is used. Ma and Pope (2003) also use this to account for missing observations since the relative stability of the reported HI values for any given country would suggest that using the binary characterizations would be appropriate.

3.4 Data and Methodology

This chapter uses the same sample period and data as Chapter Two (for brevity, please refer to Chapter Two, Section 2.4 for the complete data sources). The IBC rating is obtained from the *Country Forecasts* publication from the Political Risk Services, various issues. Individual insurers' market shares for all 30 OECD countries are obtained from Axco Insurance Information Services. Data for total foreign premiums, foreign controlled premiums and domestic company premiums are taken from OECD published *Insurance Statistical Yearbook.*

Following Ma and Pope (2003), the level of foreign participation is measured according to the foreign establishment of insurance trade, and takes direct premiums per capita in USD as a proxy. Here, two specifications of foreign participation are used, namely, foreign controlled insurers and foreign controlled *plus* foreign agencies and branches. Doing so allows us to investigate if there exists any differences in the underlying relationships between total foreign participation versus locally incorporated foreign controlled insurers. In addition, as a comparative study, another model based on the domestic participation level is specified. This enables us to identify possible differences in the hypothesized relationships between domestic participation and foreign participation levels.

Inflation figures, short term interest rates and M2 are obtained from the IMF's *International Financial Statistics* CD-ROM. Population figures are from OECD *Economic Outlook: Annual and Semi-annual data, Vol 2003, release 01.* Education level (measured by tertiary GER) is obtained from the *UNESCO Statistical*

Yearbook. Social Security data is from the OECD *Public Expenditure, Vol 200, release 01.* Average life expectancy figures are from the *World Competitiveness Yearbook,* various issues. GDP figures and exchange rates are in nominal terms and taken from the OECD Annual National Accounts - volume I - Main aggregates *Vol 2002, release 04.* For consistency, the GDP figures are on a per capita basis and are expressed in USD. The exchange rates for countries that switched to the Euro in 1999 have those years adjusted using the fixed exchange rate between the Euro and the domestic currency as obtained from the European Central Bank.

In investigating what determines the level of foreign participation in life insurance markets, both pooled cross sectional OLS estimation as well as pooled cross sectional Generalized Method of Moments (GMM) estimation are used. Here, GMM is used to take into account the presence of endogeneity, heteroscedasticity multicollinearity and measurement errors inherent in the data (for a further discussion on the justifications for GMM, please refer to Chapter Two Section 2.4.2). Here, the White variance – covariance matrix is used to adjust for any possible heteroscedasticity, as well as the over identifying estimation technique (given the proper choice of instruments) to mitigates the effects of multicollinearity arising from a smaller condition index[32]. Following from Chapter Two, lagged variables are

[32] As previously mentioned in Chapter Two, instrumental variables estimation reduces the impact of the problem of multicollinearity as the relatively large condition index of the OLS X'X matrix (associated with high multicollinearity) is reduced when using the Z'X matrix of instrumental variables (which has a smaller condition index). In the case of over-identifying instruments, the combination of the proper instruments with the smaller condition index as used in equation 2.3 will result in a mitigating impact of the multicollinearity on the GMM estimates.

used as instruments as these generally satisfy the criteria of being highly correlated with the explanatory variables and uncorrelated with the error terms.

The following models for foreign participation are proposed and two specifications of foreign participation are tested: Foreign Controlled Insurers (direct premiums per capita in USD from foreign controlled insurers) and Total Foreign (measured by the sum of direct premiums per capita in USD of foreign controlled insurers and foreign agencies and branches). In addition, a further model is tested using Domestic Insurers (direct premiums per capita in USD of all domestically incorporated insurers, of which foreign controlled insurers are included) as a comparative study with foreign participation levels. Thus, the following models are tested:

$$LOG(FORT) = \beta_0 + \beta_1(AI) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4 LOG(IN) + \beta_5 LOG(DR) + \beta_6 LOG(SS) + \beta_7 LOG(EDU) + \beta_8 LOG(FD) + \beta_9 IBC + \beta_{10} HI + \varepsilon_1 \quad (3.1)$$

$$LOG(FC) = \beta_0 + \beta_1(AI) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4 LOG(IN) + \beta_5 LOG(DR) + \beta_6 LOG(SS) + \beta_7 LOG(EDU) + \beta_8 LOG(FD) + \beta_9 IBC + \beta_{10} HI + \varepsilon_2 \quad (3.2)$$

$$LOG(DOM) = \beta_0 + \beta_1(AI) + \beta_2 LOG(LE) + \beta_3 LOG(MS) + \beta_4 LOG(IN) + \beta_5 LOG(DR) + \beta_6 LOG(SS) + \beta_7 LOG(EDU) + \beta_8 LOG(FD) + \beta_9 IBC + \beta_{10} HI + \varepsilon_3 \quad (3.3)$$

Where,

FORT= Total Foreign Participation (premiums per capita in USD);

FC = Foreign Controlled Participation (premiums per capita in USD);

DOM = Domestic Participation (premiums per capita in USD);

AI= Anticipated Inflation, using the adaptive measure of average inflation rates over past 5 year as a proxy;

LE=Average Life Expectancy;

MS=Foreign Participants' Market Share;

IN=Income (nominal GDP per capita in USD);

DR=Dependency Ratio (under 15 and over 64/ 15-64);

SS=Social Security Expenditure (per capita in USD);

EDU= Human Capital (measured by Tertiary GER);

FD=Financial development, (ratio of M2 to GDP);

HI = Herfindahl Index (dummy of 1 (non-competitive) for HI values >1800, else 0);

IBC = International Business Climate rating;

3.5 Empirical Results

Tables 3.1 and 3.2 present the pooled OLS and GMM results respectively. Here, the Lagrange Multiplier (LM) test for heteroscedasticity is insignificant for both the total foreign (FORT) and foreign controlled (FC) models but is significant for the domestic (DOM) model. The average adjusted R^2 across the three models is 0.8783 while the Jarque-Bera test statistics confirm the normality of residuals for all three models. The results from the GMM estimation also confirm those obtained using OLS with the expected signs and significances, while the Hansen J tests of over identifying instruments indicate the suitability of the instruments used for all three models.

For both the foreign participation models (FORT and FC), the regression and GMM results show consistent signs and significance. The foreign market share (MS) variable is found to be positive and highly significant. This is especially interesting as it contrasts with the results found in Chapter Two where a negative relationship with demand for total life insurance is instead found. This suggests that unlike demand for total life insurance, the level of foreign participation is dependent on the level of openness of the domestic economy instead of the underlying level of competition in the domestic economy. This is further substantiated by the significance of the IBC variable, which is significant and positive for both foreign participation models. The significance of the IBC variable essentially confirms the importance of trade liberalization in attracting foreign insurer participation.

In contrast, the domestic model reveals a different picture. Instead of a positive sign for foreign market share, a negative relationship is found, supporting the alternative hypothesis that the level of foreign market share reflects the underlying level of competition in the domestic market. Thus, a lower level of foreign market share results from lower life insurance prices due to a more competitive market. This in turn leads to greater domestic participation levels. The Herfindahl Index (HI) variable in this case substantiates this theory and is found to be significant with the hypothesized negative relationship. This is consistent with the result for foreign market share in the domestic model as the Herfindahl Index measures the level of competition in the domestic economy. Thus, unlike Ma and Pope (2003), this chapter finds that for life insurance markets, the level of openness and liberalization are more important to foreign life insurers compared to foreign non-life insurers. In addition,

the results show that the level of competition in the life insurance market is more relevant to domestic rather than foreign participation levels.

The level of financial development is also found to be significant for all three models. Here, the FD variable has the expected positive relationship with foreign participation levels, supporting the hypothesis that more developed domestic financial markets attract increased foreign participation. This is not at all surprising as the level of financial development is important in assessing the risks involved for foreign investors. In more developed financial markets, regulatory and reporting requirements are generally more sophisticated, with more transparency required in terms of financial reporting and corporate governance issues, thus making domestic investments by foreign insurers more attractive. Furthermore, broader and deeper financial markets indicate greater insurance opportunity, as represented by greater numbers of sophisticated domestic investors for foreign insurers to market their products.

Among the socio-economic variables, income is found to be significant with the hypothesized positive sign. This corroborates the results of Chapter Two, that higher levels of income increase a country's ability to consume life insurance products. In this case, the higher purchasing power of the domestic population provides a more attractive environment for foreign insurance companies to enter, thus resulting in a greater level of foreign participation.

The dependency ratio variable (DR) is only significant in the foreign controlled (FC) model. The positive relation here is consistent with Chapter Two, Campbell (1980),

Lewis (1989), Browne and Kim (1993) and Outreville (1996) and supports the theory that an increased number of household dependents result in a greater need for life insurance protection, resulting in a more attractive market for foreign life insurers.

Social security expenditure is found to be negative and significant for all three models. Thus, the relationship between social security expenditure and both foreign participation and domestic participation are the same and in agreement with existing literature. This follows from the Chapter Two results where social security expenditure proxy's national wealth, which acts as a substitute for life insurance consumption (Lewis (1989)). Thus, countries with a larger social security program would generally have a smaller level of foreign participation.

The human capital variable (EDU) is positive and statistically significant for all three models. This supports the underlying theory (Browne and Kim (1993), Browne, Chung and Frees (2000) and Chapter Two) that a greater level of human capital reflects higher risk aversion, which increases the attractiveness of domestic markets to foreign insurers.

3.6 Conclusion

This chapter investigates the factors that govern the level of foreign participation in life insurance markets. Here, two specifications of foreign participation are used, as well as a model based on domestic participation as a comparative study.

The results of this chapter have several important implications for existing literature. Following from the work done by Chapter Two and the existing insurance demand and supply literature[33], Chapter Three improves upon the only other study done in the area of foreign insurers' participation (Ma and Pope, 2003) by documenting the relevance of the demand for life insurance literature to foreign participation levels in life insurance markets through the incorporation of domestic and market specific variables. In addition, with the growing importance of insurance services provided by multinational financial institutions, the significance of the location-specific variables found in this chapter also provides an empirical starting point in developing an extension of the eclectic framework in which to view the internationalization of insurance services. Thus, this chapter also contributes to the literature on FDI in insurance services and the foreign participation of multinationals.

Specifically, this chapter finds that for life insurance markets, the level of openness of the domestic economy is more important than the underlying level of competition in determining the level of foreign participation. Consistent with this theory, the IBC proxy for liberalization is positive and significant. This result suggests that regulatory activities by host governments such as taxes and other non-tariff barriers imposed on foreign insurers reduce their ability to price their products competitively relative to domestic insurers, resulting in a less attractive business environment. This is in contrast to domestic participation levels, where it is found that the competitiveness of the market is instead more important. Here, the variable for market competitiveness (HI) corroborates this with a significantly negative result.

[33]See Beenstock, Dickinson and Khajuria (1988), Outreville (1990), Browne and Kim (1993), Outreville (1996), and Ma and Pope (2003).

In addition, the results also suggest that the factors attracting foreign participation to life and non-life insurance markets are different. Ma and Pope (2003) find that for non-life markets, instead of the level of openness of a country's economy, a higher level of competition generally correlates with higher foreign participation. One reason for this might lie in the different natures of non-life and life insurance products. If for example life insurance were more profitable than non-life insurance (this could arise from different premium taxes placed on different types of insurance products, or a larger absolute market size since life insurance markets are generally larger than non-life markets), then the level of openness of an economy would be more of a factor governing the participation of foreign insurers. For non-life markets, given that they are less profitable, the level of competition would then be of greater concern to foreign insurers in deciding to enter a market, as this will have a direct impact on their ability to justify their costs of entry.

Other factors that are found to be important in attracting foreign insurers in life insurance markets include lower levels of social security expenditure, higher human capital accumulation as well as greater financial development. These findings are consistent with existing literature and confirm the relevance of underlying theory with identifying factors that contribute to foreign participation levels in life insurance markets.

Currently, there has been much work done regarding the implications of foreign bank entry to the host country[34] as well as the performance and efficiency of foreign banks

[34] Claessens et al (2001), Levine (1996), Gelb and Sagari (1990), Walter and Gray (1983) and Goldberg and Saunders (1981).

in both developed and developing countries[35] however literature on the internationalization of insurance services is sorely lacking. There is much work needed to fill up this empirical gap with additional research needed in investigating the performance of insurance companies after internationalization as well as the impacts on domestic companies and host markets based on paradigms that incorporate factors from the insurance sector. The recent wave of financial market liberalization across developing countries provides ample opportunities for such research. In addition, trends in the popularization of bacassurance open many more opportunities to explore various theories on bank and insurance foreign participation levels in both developing and developed economies. This chapter leaves these challenges to future research.

[35] Claessens et al (2001) and Sturm and Williams (2002).

Table 3.1
Pooled Cross Country Estimates (Ordinary Least Squares)

Table 3.1 presents pooled OLS estimates using the historic looking adaptive approach (AI) to measuring anticipated inflation, defined as the average inflation rate of the previous five years.

	Total Foreign (FORT)		*Foreign Controlled (FC)*		*Domestic (DOM)*	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	-27.3245	-1.2428	-16.0736	-0.7183	-3.8010	-0.2316
Anticipated Inflation (AI)	-0.0189	-1.3893	-0.0012	-0.0938	-0.0370	-3.6577***
Life Expectancy (LE)	3.7625	0.727	0.6875	0.1303	0.5968	0.1546
Foreign Market Share (MS)	0.8989	11.4920***	0.7343	8.5884***	-0.2212	-4.0313***
Income (IN)	0.5119	2.1680**	0.5198	2.3077**	0.3955	2.2535**
Dependency Ratio (DR)	0.6653	1.2496	0.9770	1.8815*	0.1974	0.5033
Social Security (SS)	-0.2169	-4.6205***	-0.0866	-1.7048*	-0.1785	-5.2375***
Human Capital (EDU)	1.974	4.9639***	2.4697	6.2603***	1.4686	4.9726***
Financial Development (FD)	0.9754	2.2264**	1.0304	2.2977**	1.3845	4.5640***
Herfindahl Index (HI)	0.4239	0.9631	0.0393	0.0938	-0.8031	-2.4450**
IBC rating (IBC)	0.0325	2.2696**	0.0270	1.7836*	0.0127	1.1950
Adjusted R Squared	0.8592		0.88638		0.8893	
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
LM Het Test	2.6966	0.1010	0.0182	0.8930	8.9381	0.0030
JB	4.1565	0.1250	2.07721	0.3540	1.3949	0.4980

*Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance

JB – Jarque-Bera test statistic for normality, LM – Lagrange Multiplier test for heteroscedasticity. Total Foreign is defined as the sum of foreign controlled. Companies *plus* foreign agencies and branches. Foreign controlled firms are locally incorporated while the domestic dependent variable is defined as all locally incorporated companies including foreign controlled firms.

Table 3.2
Pooled Cross Country Estimates (Generalized Method of Moments)

Table 3.2 presents pooled GMM estimates using the historic looking adaptive approach (AI) to measuring anticipated inflation, defined as the average inflation rate of the previous five years.

	Total Foreign (FORT)		*Foreign Controlled (FC)*		*Domestic (DOM)*	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	-14.5002	-0.8301	-5.6221	-0.2827	7.0442	0.4835
Anticipated Inflation (AI1)	-0.0158	-1.3519	0.0059	0.6015	-0.0398	-3.3388***
Life Expectancy (LE)	0.6867	0.1627	-2.1523	-0.4617	-1.8589	-0.5376
Foreign Market Share (MS)	0.9135	11.4718***	0.8012	11.0728***	-0.2309	-4.2291***
Income (IN)	0.6518	2.6909***	0.7993	3.9667***	0.4382	2.1609**
Dependency Ratio (DR)	0.6337	1.5475	1.1523	2.8341***	0.0138	0.0425
Social Security (SS)	-0.2113	-6.0132***	-0.0978	-2.5958***	-0.1951	-6.0733***
Human Capital (EDU)	1.8853	5.1551***	2.3695	6.3921***	1.3623	5.0220***
Financial Development (FD)	0.9882	2.4706**	1.1574	3.1647***	1.4822	6.0112***
Herfindahl Index (HI)	0.3738	1.3480	0.2914	0.9929	-0.8690	-3.2190***
IBC rating (IBC)	0.0258	2.0651**	0.0222	1.7981*	0.0118	1.1823
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
Hansen J Test	3.8681	0.4240	3.6633	0.4530	6.0392	0.1960

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance
JB – Jarque-Bera test statistic for normality; LM – Lagrange Multiplier test for heteroscedasticity; HJ test – Hansen J test for over identifying instruments. Total Foreign is defined as the sum of foreign controlled companies *plus* foreign agencies and branches. Foreign controlled firms are locally incorporated while the domestic dependent variable is defined as all locally incorporated companies including foreign controlled firms.

Appendix 3A: *Subsidiary Tests Using Control Variables*

As in Chapter Two, subsidiary tests are done controlling for the financial freedom that has existed within the EU member countries in recent times. As in Appendix 2A, 18 of the 25 EU members are included in this chapter's sample, and a dummy

Pooled GMM Cross Country Subsidiary Estimates

Results are based on the historic looking adaptive approach (AI) to measuring anticipated inflation, defined as the average inflation rate of the previous five years.

	Total Foreign (FORT)		*Foreign Controlled (FC)*		*Domestic (DOM)*	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	-21.2682	-1.2207	-12.5164	-0.9299	7.1621	1.1659
Anticipated Inflation (AI1)	-0.0137	-1.0521	-0.0597	-1.1659	-0.0172	-6.5524***
Life Expectancy (LE)	1.9514	0.4645	-2.4468	1.1170	-1.2949	-1.5056
Foreign Market Share (MS)	0.9885	11.4645***	1.2179	9.1433***	-0.5634	-4.8929***
Income (IN)	0.6399	2.2384**	0.3760	3.3546***	0.6430	2.1609**
Dependency Ratio (DR)	0.7984	1.8085*	1.8376	3.6873***	0.8535	1.8815*
Social Security (SS)	-0.1591	-3.1204***	-0.1675	-1.9091*	-0.2402	-5.0898***
Human Capital (EDU)	1.9411	4.7631***	1.9685	5.8610***	3.0858	7.9395***
Financial Development (FD)	1.0079	2.5872**	0.6982	2.1467**	1.7899	5.0374***
Herfindahl Index (HI)	0.7201	1.4910	0.9637	1.2660	-0.7596	-4.9639***
IBC rating (IBC)	0.0345	2.6057***	0.0105	1.7119*	0.0721	0.4900
European Union Dummy (EU)	0.5178	3.6756***	0.3713	2.2637**	1.1270	5.1222***
Diagnostics	*Estimate*	*P- Value*	*Estimate*	*P- Value*	*Estimate*	*P- Value*
Hansen J Test	3.4390	0.4610	4.8925	0.3420	4.0833	0.3960

* Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significnace, HJ test – Hansen J test for over identifying instruments.

denoting 1 for members and 0 otherwise is added into the original three models tested.

The results show that the inclusion of the EU variable does not change the findings of Chapter Three. Additionally, across all three models, the EU dummy is found to be positive and significant, once again confirming the positive impact of greater financial freedom among the EU members on the level of foreign participation in domestic life insurance markets.

CHAPTER 4

FOREIGN EXCHANGE EXPOSURE: EVIDENCE FROM THE U.S. INSURANCE INDUSTRY

4.1 Introduction

With the continued liberalization of international financial markets and the proliferation of trade in financial services, the role of international insurance services is becoming increasingly important. Moshirian (1999a) notes the size of international trade in insurance services, which includes the traditional income from premium revenues, as well as income from foreign direct investment and from holding foreign assets. These activities are generally undertaken by insurance companies and pension funds, with an increasing number of banks moving into bancassurance and participating in insurance activity.

In 2002, the U.S. alone was responsible for 38.1 percent of global total premium volume. Trade in international insurance services also plays an important role in the U.S. economy. According to 2002 figures from the Survey of Current Business published by the U.S. department of commerce, FDI inflows and outflows from

finance (excluding depository institutions) and insurance were US$163 billion and US$244 billion respectively.

Within the area of international financial services, the importance of detecting and measuring foreign exchange exposure for international risk management strategies is becoming increasingly recognized. The majority of the work done in the area of foreign exchange exposure centers on the impact of foreign exchange volatility on international trade, firm value and the use of derivative and operational hedging strategies. Most of these studies focus on U.S. firms (for example Nance, Smith and Smithson (1993), Bartov and Bodnar (1994) and Choi and Kim (2003)) while others provide cross-country comparisons (Chamberlain et al (1997), He and Ng (1998), and Doukas et al (2003)). The few studies that focus on financial services have mainly concentrated on banks (Choi, Elyasiani and Kopecky (1992), Choi and Elyasiani (1997) and Chamberlain et al (1997)), while those that do look at the insurance industry look more at hedging and risk management (Colquitt and Hoyt (1997), Cummins, Phillips and Smith (1997), Hentschel and Smith (1997), Cummins, Phillips and Smith (2001)).

This chapter contributes to existing literature by providing for the first time direct evidence documenting the importance of foreign exchange exposure to the insurance industry. Prior research examining foreign exchange risk faced by insurers focus more on general risk management strategies and its determinants, rather than specifically looking at the area of foreign currency risk exposure. Detecting such exposure in the U.S. insurance industry thus provides an important starting point in

identifying the determinants of exchange rate risk exposure within international insurance services.

Unlike previous studies that use aggregate data (Jorian (1990), Bodnar and Gentry (1993), Chow, Lee and Solt (1997b)) that may not account for firm-specific trade linkages, this chapter conducts individual firm level estimations to avoid the averaging effects arising from the grouping of firms. The research design of such studies potentially disguises firm-specific information such as operational and managerial differentials, making the identification of significant currency exposure difficult (Bartov and Bodnar (1994)). The potential estimation problem of investor mispricing is also avoided by using a cash flow based approach that allows for the 'cleaner' detection of foreign exchange exposure. Using a cash flow based methodology significantly contributes toward the area of foreign exchange exposure management since a major reason firm managers seek to manage currency risk comes from their desire to control cash flow volatility (Smith and Stulz (1985), Stulz (1984), Froot, Sharfstein and Stein (1993) and Bodnar and Marston (1996)).

Within the literature on foreign exchange exposure, life and non-life insurers are compared for the first time. The evidence shows that there does not exist any systematic difference in the foreign exchange risk profiles between the two. This suggests life and non-life insurers have similar risk exposure management strategies arising from similar risk pooling and financial intermediary functions. The empirical results reveal that a sizable proportion of U.S. insurers are exposed to foreign exchange movements to the seven largest U.S. trade partners in insurance services (These include the U.K., Japan, Switzerland, France, Germany and Canada, Survey

of Current Business (2003)). The presence of an operational effect is also documented, suggesting that the geographic diversity of multinational insurers correlates with increased hedging activity. This chapter also finds that the frequency of foreign exchange exposure increases with the time horizon, thus corroborating the theory that multinational firms prefer to use derivatives to hedge shorter-term transactional exposure over the longer-term economic exposure that is harder to assess.

This chapter is organized in the following way. Section 4.2 provides an overview of the relevant literature on foreign exchange exposure and currency risk management. Section 4.3 follows this where the empirical hypotheses are discussed. Section 4.4 elaborates on the various econometric aspects pertaining to the methodology used in this chapter along with the formalized model used for detecting foreign exchange exposure. Section 4.5 provides the data sources and analysis of the sample. Section 4.6 contains the results according to the various hypotheses tested together with their implications. Finally, Section 4.7 concludes this chapter by providing a summary of the main results and suggests avenues for future research.

4.2 Literature Review

Existing literature has established that factors motivating firms to manage risk also apply to the insurance industry (Santomero and Babbel (1997) and Cummins and Sontomero (1999)). Thus, the importance of foreign exchange exposure to the operating performance of insurance companies is indeed a much-neglected area within existing literature given the continued internationalization of financial and

insurance markets. This section provides an overview of the issues surrounding the literature on foreign exchange exposure and how they relate to the insurance industry. These include how foreign exchange volatility relates to international trade, financial intermediaries and the hedging and risk management strategies of multinationals.

4.2.1 The Nature of Foreign Exchange Exposure

Foreign exchange exposure can be generally classified into transactional exposure and economic exposure. Transaction exposure refers to changes in cash flows that result from unexpected changes in the foreign exchange rate that affect contractual obligations. It occurs between the time a contract has been entered into until it is due to be settled. This exposure is considered easily evaluated and hence easily hedged with the use of off balance sheet instruments such as options, forwards, futures, and swaps.

In contrast, economic exposure measures the change in net present value of the firm resulting from changes in future operating cash flows due to foreign exchange rate movements. An example of economic exposure would be a firm that faces increased competition from foreign exporters because of changes in the domestic exchange rate relative to the foreign firm's currency. This in turn affects the domestic firm's revenue, costs, and ultimately cash flows. Because economic exposure deals with future cash flows, it is typically longer term, difficult to ascertain, and as such, not easily hedged. Pringle and Connolly (1993) demonstrate this by attempting to use short-term instruments to sequentially hedge current transactions. They find that the

difficulty to ascertain economic exposure prevents them from doing so, and suggest that to manage economic exposure effectively, natural hedges should be used where foreign currency inflows and outflows are matched using foreign currency debt or offshore production facilities.

Pantzalis, Simkins and Laux (2001) classify foreign exchange exposure into transactional and operational, which are mainly short-term and long-term respectively. Operational exposure in this case refers to a firm's real assets and liabilities that are denominated in foreign currency. Because of the nature of these assets and liabilities, they are also longer term and can be managed using operational hedges.

4.2.1.1 Determinants of Foreign Exchange Exposure

Studies on currency exposure generally use a two-step approach of first identifying exchange rate exposure coefficients, then using those estimations to investigate if certain accounting or economic variables can explain their variation (Jorian (1990), Chamberlain et al (1997), He and Ng (1998), Chow, Lee and Solt (1997b), Miller and Reuer (1998), Choi and Kim (2003), and Nguyen and Faff (2003) amongst others)).

Jorian (1990) finds foreign currency exposure is positively correlated to foreign involvement, using the ratio of foreign to total sales as a proxy. Chow, Lee and Solt (1997b) investigate the determinants of foreign exchange exposure using accounting measures such as foreign sales to total sales and size. He and Ng (1998) use the

export ratio and proxies for hedging needs in their model for foreign exchange exposure. They find that firms with a high level of leverage, or with low liquidity tend to exhibit low exposure. Size is also found to have a positive relation to foreign exchange exposure. Miller and Reuer (1998) examine foreign exchange movements relative to the economic exposure of firms. Factors such as FDI, net export intensity, and research and development are tested. They find that FDI and economic exposure to currency movements are negatively related.

4.2.2 Similarities Between Banking and Insurance

Existing literature on foreign exchange exposure and banks are relevant to international trade in insurance in light of the close similarities between the two. This has its starting point within one of the more important traditional roles that both banks and insures play, which is that of financial intermediation. Banks and insurance companies serve as financial intermediaries in that they bridge the gap between household sources of funds and corporate users of funds. With the rise of large financial conglomerates and the deterioration of firewalls traditionally separating the banking and insurance industries, the distinction between the traditional roles of banks and insurers (savings versus risk bearing) is becoming increasingly vague. This is being made more apparent with the increasing popularity of bancassurance, especially in Europe and Asia (Swiss Re, Sigma, 2002, No. 7).

Bryis and Varenne (1997) shed some light on traditional myths that separate the banking and insurance sector. They argue that some of the main reasons insurers give to express their uniqueness from the banking sector can actually be reduced to

similar provisions that banks make. Put simply, these include insurance contracts being equivalent to options, and bank deposits being equivalent to the provision of liquidity insurance.

Other examples of similarities between banking and insurance include parallels between their sources of funds. Where banks use deposits as its source of funds, insurance companies use premiums. The uses of these funds are also similar (apart from maturity and risk differences arising from the intrinsic difference in the actuarial dimension between banks and insurers' liabilities[36]), and for banks, are mainly directed towards loans, investments and acquisitions. For insurers, these are mainly directed toward insurance contracts, investments and acquisitions. Thus, the similarities are apparent. Banks make loans up front and collect interests in arrears, while insurance companies collect premiums up front and pay claims in arrears. Underwriting of loans by banks is also akin to the underwriting of commercial and larger personal lines accounts by insurers; while the renewal of loans by banks is analogous to insurers' have renewal cycles. Both operate with reserves, rely on the law of large numbers, use economies of scale and have expertise in administration and in money management. They create liquidity and ensure a risk-spreading function through reinsurance and refinancing.

In recent times, insurers and banks are increasingly offering products that are similar and compete with each other. For example single premium endowment policies (especially when the endowment period is short) are similar to fixed deposits in

[36] According to Bryis and Varenne (1997), even this traditionally recognizable difference is arguable not the case.

terms of risk and return. With the development of more varied types of insurance products, insurers are starting to market more investment type products that are highly akin to the investment products of banks. Examples include variable life policies that place the premiums of policyholders into investment vehicles like mutual funds according to their risk preferences, and private pension funds that are increasingly forming a large part of insurers' portfolios (Saunders (2000)).

In terms of financial stability, there are also similarities between the banking and insurance industries. Banks generate profit by mismatching the maturity of its assets when short-term deposits are received and longer-term loans given out. The spread between the commercial bank's cost of funds and interest payments received on its loans are a major source of income. Thus, at any one time, the bank will not have enough capital pay off all its depositors. As long as there is no simultaneous withdrawal of deposits from the bank (a case in point would be a bank run arising from a loss of confidence by depositors in the ability of the bank to meet its commitments), the bank will be able to function and generate profit in this way. Similarly, for insurance companies, should all policyholders' withdrawal their contracts at the same time, the end-result will be the same as with the abovementioned bank.

4.2.3 Foreign Exchange Exposure and Firm Value

Given that exposure to foreign currency movements affect the potential earnings of both domestic and multinational firms via direct and indirect channels, the underlying value of the firm will no doubt also reflect such exposure. This impact of

foreign currency movements on earnings is well acknowledged in both academic and industry circles. With unexpected depreciations in the home currency, multinationals with foreign operations and sales benefit since expected cash inflows then translate into larger home currency figures. Pantzalis, Simkins and Laux (2001) classify this type of foreign exchange exposure as transaction exposure that is usually short-term and easily hedged.

Existing literature to date provides only weak evidence as to the significance of contemporaneous foreign exchange exposure on firm value via stock return fluctuations for U.S. multinationals (Jorian (1990), Bodnar and Gentry (1993), Amihud (1994), Bartov and Bodnar (1994), and Choi and Prasad (1995). He and Ng (1998) however find that contemporaneous foreign exchange effects are in fact significant in explaining firm value of Japanese multinationals. Bartov and Bodnar (1994) suggests that possible reasons for the weak results in contemporaneous foreign exchange estimation include, 1) investor mispricing given the complexity of foreign exchange impacts on firm performance and value[37]; and 2) the aggregating effect arising from sample selection. This aggregating effect stems from the heterogeneous nature of operations, as well as managerial and other firm-specific characteristics that induce noise into the sample[38], disguising any identifiable foreign exchange exposure. To overcome investor mispricing, the use of lagged foreign exchange rate changes is suggested by subsequent studies as a better specification to capture the effects of foreign exchange exposure. The resulting evidence on the

[37] Bartov and Bodnar (1994) term this the Lagged Response Hypothesis, which basically suggests that foreign exchange exposure should be detected based on a lagged model given that investors need time to process the potential economic implications of changes in the exchange rate on firm value.

significance of this lagged foreign exchange effect on U.S. companies have been documented by Bartov and Bodnar (1994) and Amihud (1994), Martin, Madura and Akhigbe (1999) and Choi and Kim (2003).

Choi and Prasad (1995) address the potential weaknesses that mask the identification of foreign exchange exposure effects[39] by conducting industry and firm level analyses that overcome the averaging effects of aggregate data. In doing so, firm-specific determinants of foreign exchange exposure are also tested. The estimation and identification of foreign exchange exposure is first done using stock return data, where a two-factor model is specified to identify the impact of foreign exchange fluctuation on firm value. Firm-specific effects are then investigated using variables such as foreign sales revenue, foreign identifiable assets and foreign profit in cross sectional comparisons of individual firms. Based on the results of these three variables, a positive relationship is documented between U.S. multinationals' operational scope and foreign exchange exposure.

Chow, Lee and Solt (1997b) study foreign exchange exposure from the perspective of transactional exposure (short term, easily hedged) and economic exposure (longer term, hard to ascertain and difficult to hedge). They furnish evidence documenting the existence of foreign exchange exposure using stock returns on four U.S. diversified equity portfolios and 213 U.S. multinationals. In addition to a size effect, they also find that foreign exchange exposure increases in accordance with the time horizon. Martin, Madura and Akhigbe (1999) also estimate the exposure for 168 U.S.

[38] This also includes unique asset, cash flow exposure positions and hedging strategies between firms.

[39] See Bartov and Bodnar (1994).

multinational corporations operating in Europe using contemporaneous and lagged exchange rate factors and find that 27 out of the 168 are significantly exposed.

Looking at international and operational risk management strategies for U.S. firms exposed to the Asian market, Choi and Kim (2003) find significant exposure in about 30 percent of U.S. firms to contemporaneous and lagged changes in real exchange rates. However, the study fails to provide any conclusive evidence on the direction of such foreign exchange exposure since the exposure coefficients consist of both positive and negative signs. In terms of operational exposure, the authors' find that a strong dollar has a negative impact on firm value if those firms have initial high export and Asian sales positions.

Given that most of the work done in foreign exchange exposure focus on the U.S, several studies look to the Japanese market for a means of providing corroborative evidence for some of the relationships found in existing literature. One such study that looks to the Japanese market is He and Ng (1998). In studying the Japanese market, their study finds that for Japanese multinationals, firm value as measured by stock returns react positively (negatively) to depreciations (appreciations) of the yen against other foreign currencies. Their findings thus provide supportive evidence for the traditional school of thought regarding the impact of foreign exchange volatility on firm profitability, where a weaker (stronger) domestic currency increases (reduces) the competitiveness of exports and has a positive (negative) direct impact on income through the conversion of foreign earnings into domestic currency. Doukas et al (2003) investigate the relationship between foreign exchange exposure and Japanese firms traded on the Tokyo stock exchange between 1975 and 1995. The

authors' document the sensitivity of Japanese firms to contemporaneous unexpected foreign exchange movements. In addition, they find that the foreign exchange exposure effect for multinationals and high exporting firms is greater as compared to domestic and low exporting firms. In sub-grouping firms according to more specific characteristics such as economic involvement and size, they overcome the sample selection problem that Bartov and Bodnar (1994) suggest masks the identification of foreign exchange exposure.

4.2.4 Impact of Foreign Exchange Exposure on Multinational Firms' Cash Flow

According to Doukas et al (2003) and Koutmos and Martin (2003), foreign exchange exposure potentially affects firm value through the altering of cash flows via changes in the volume of international trade and the cost and/or amount of hedging activity vis-à-vis currency derivatives.

4.2.4.1 International Trade

A large portion of research in foreign exchange exposure concentrates on the impact of exchange rate volatility on trade flows. This is because foreign currency levels are a major factor that contributes to a multinational's uncertainty in product demand and net profits. The impact of foreign exchange exposure on international trade will thus affect firms differently, according to their operational and cash flow exposure to specific currencies and countries. Specific foreign exchange exposure relationships are thus especially hard to identify due to unique firm-specific trade linkages.

Given the increased levels of risk and uncertainty in the presence of exchange rate exposure, international trade flows would generally be dampened as foreign exchange volatility increases. To date, literature is inconclusive as to the significance of foreign exchange exposure on international trade flows. Where there is evidence of foreign exchange volatility on international trade volume[40], there is however no general agreement as to the directions of such impact. These differences largely arise due to different sample periods, measures of volatility and country-specific factors such as whether the country in question is a developing or developed economy.

Bailey et al (1986 and 1987), Bailey and Talvas (1988), Giovannini (1988), Koray and Lastrapes (1989), Kumar (1992), Belanger et al (1992) and Gagnon (1993) find that foreign exchange exposure does *not* affect international trade. Bailey et al (1986) examine seven large industrial OECD countries and do not find significant evidence linking foreign exchange volatility to the level of trade. Looking at aggregate U.S. export volume and foreign exchange volatility, Bailey and Tavlas (1988) use two measures for volatility but do not find any significant results. Belanger et al (1992) find insignificant estimates when studying exchange rate exposure using U.S. import data from Canada despite using two measures, namely the 90 day forward spread and a non parametric method to isolate risk premium. Using quarterly data, Ganon (1993) attempts to identify real exchange rate effects on U.S. trade with five other

[40] See Bailey and Tavlas (1988), Belanger et al (1992), Kumar (1992), Ganon (1993) and Kroner and Lastrapes (1993).

industrialized countries. He however fails to find any significant linkages between foreign exchange movements and trade.

Of the work done that finds evidence relating foreign exchange exposure to international trade flows, Giovannini (1988), Asseery and Peel (1991), Franke (1991), Sercu and Vanhulle (1992) and McKenzie and Brooks (1997) find that increased foreign exchange volatility may have beneficial effects on trade. For exporting firms, Sercu and Vanhulle (1992) find a positive impact of foreign exchange volatility on firm value. They suggest that this arises from the price and volume effects due to beneficial exchange rate movements. McKenzie and Brooks (1997) use an Autoregressive Conditional Heteroscedasticity (ARCH) model for exchange rate volatility and apply that to U.S. and German trade flows. They find statistically positive evidence that foreign exchange volatility actually increase the level of U.S.- German trade flows.

In contrast, other studies find evidence that support the obstructive role of foreign exchange volatility on international trade (Cushman (1983), Akhtar and Hilton (1984), Kenen and Rodrick (1986), Kumar and Dhawan (1991), Chowdhury (1993), Doroodian (1999) and Arize, et al. (2000)). One such example is the case of developing countries. Given their less developed financial markets and greater market inefficiencies that prevent effective hedging strategies, foreign exchange volatility would generally have a more significant negative impact on trade as compared to the more developed economies. Doroodina (1999) and Arize et al (2000) both document a significantly negative impact of real effective exchange rate volatility on a developing country's short-term and long-term export demand.

Still other studies find evidence of either a positive or negative influence of foreign exchange volatility, depending on perspective of trade flow (e.g. either imports or exports). Kroner and Lastrapes (1993), using a GARCH model finds mixed results with often insignificant estimates with changing signs. Qian and Varangis (1994) also document significant results but with both positive and negative signs.

4.2.4.2 Hedging Activity

Another channel in which foreign exchange exposure affects a multinational firm's cash flow stems from the volume and/or cost of hedging activity. Nance, Smith and Smithson (1993), Froot, Scharfstein and Stein (1993), Bodnar, Hayt and Marston (1996), Geczy, Minton and Schrand (1997), Chamberlain et al (1997) and Bodnar, Hayt and Marston (1998)) all document the importance of hedging in insuring against the negative effects of unexpected foreign exchange movements on cash flows.

Modigliani and Miller (1958) point out that corporate financing policy is irrelevant with fixed investment policy and with no contracting costs or taxes. This implies that hedging has no impact on firm value. Thus, even though the volatility of future uncertain cash flows is reduced, there should not be any consequent impact on the value of the firm, meaning that hedging simply represents a dead weight loss. This arises since individual investors are able to replicate the effects of risk management by changing the composition of their own portfolios.

Given market imperfections, Giddy (1977) however explains that there are major barriers to international portfolio investment, which serve to reduce the diversification potential of investors. In addition, investment is variable, contracting costs are non-negative and taxes exist. Smith and Stulz (1985), in a theoretical examination, postulate that as Modigliani and Miller's (1958) assumptions are relaxed, hedging decisions do become relevant and impact on firm value.

For firms with active hedging programs, greater levels of foreign exchange volatility would result in higher premium costs when using derivatives as hedging instruments. The increased incentive for firms to hedge in the face of high foreign exchange volatility is documented in Brown (2001), Koutmos and Martin (2003) and Doukas et al (2003). Koutmos and Martin (2003), in studying nine U.S. sectors, find a significantly negative relationship between foreign exchange exposure and the noncyclical consumer segment. This is contrasted with the financial sector where a significant positive correlation is found instead. These findings imply that stock returns for non-financial multinationals are inversely related to foreign exchange volatility given the increased cost and/or volume of hedging required. For financial institutions, the opposite would be the case, where a positive effect is suggested. To the extent that these financial institutions benefit from the increased sale of derivative hedging instruments, this increased incentive to hedge would result in higher abnormal stock returns.

Nance, Smith and Smithson (1993), Chow, Lee and Solt (1997b), Cummins, Phillips and Smith (1997), and Colquitt and Hoyt (1997) document a size effect in hedging, suggesting that larger firms tend to hedge more due to greater informational and

transactional cost scale economies. Bodnar, Marston and Hayt (1998) also confirm this size effect in hedging activity. In a survey of 399 completed questionnaires out of a total sample of 1928 firms, it was found that usage amongst the largest firms were the heaviest at 83 percent. This is in comparison to 45 percent for medium sized firms and 12 percent for small firms. Doukas et al (2003) further confirm that foreign exchange exposure is inversely related to the firm's size and debt to asset ratio. Their findings corroborate the theory that in addition to increased foreign exchange volatility leading to higher levels of hedging, the size of the firm is also positively related to hedging volume. This increase in hedging activity consequently results in lower levels of foreign exchange exposure[41]

Unlike the above studies that look at the determinants of hedging activity, Allayannis and Weston (2001) directly study the relationship between hedging and firm value as measured by Tobin's Q using 720 non-financial firms between 1990 and 1995. They find evidence that the use of currency derivatives is positively related to firm value, as reflected by the higher mean and median Q's of currency derivative users over non-users.

For the insurance sector, Hentschel and Smith (1997) analyze the risks in using derivatives and apply their analyses to the insurance industry. They argue that insurers have an incentive to use financial derivatives to manage currency and interest rate risks given the insurers' own risk exposure, as well as those of their loan customers. This implies that a potential source of indirect exposure to foreign exchange risk by insurers and banks would stem from the exchange rate risks that

[41] This is consistent with the findings of Allayannis and Ofek (2001).

their customers take, which affect the quality of their loans and assets. This is further corroborated by research from the banking sector, which recognize these indirect effects (Chamberlain et al (1997) and Martin and Mauer (2003).

Cummins, Phillips and Smith (2001) suggest that insurers hedge due to market imperfections such as the direct and indirect cost of financial distress, the problem of underinvestment as well as corporate income taxes. Another reason stems from banks and insurers being especially exposed to insolvency risks as reflected by an insolvency risk penalty. Thus, for insurers, hedging provides a means to reduce the probability of bankruptcy and maximize the value of the firm.

4.2.5 Foreign Exchange Exposure of Financial Institutions

A large portion of the work done in the area of foreign exchange exposure focuses on non-financial firms. This chapter looks at foreign exchange exposure of U.S. insurance companies; as such, an overview of the relevant literature for financial institutions is presented. This is especially pertinent given the potentially different impacts of foreign exchange exposure between financial and non-financial firms (Allayannis and Weston (2001) and Koutmos and Martin (2003)). Given the similarities between banks and insurance companies, Grammatikos, Saunders and Swary (1986) suggest that financial institutions face two main sources of cash flow risk derived foreign currency activities; namely, exchange rate risk and foreign interest rate risk. Exchange rate risk stems from unmatched foreign currency positions, while foreign interest rate risk arises from the mismatched durations of foreign currency assets and liabilities. Given that banks and insurance companies do

potentially mismatch the durations of their foreign assets and liabilities, foreign exchange exposure certainly plays an important role in financial institutions' exchange exposure management. This section expands more on the foreign exchange rate risks that financial institutions face.

Choi, Elyasiani and Kopecky (1992) find about 20 percent of U.S. banks to be significantly exposed to foreign exchange risk from 1975 to 1987 based on aggregate bank earnings. This aggregation however makes it difficult to link the estimated foreign exchange risk to individual bank specific characteristics. In cross country comparisons, Chamberlain et al (1997) (1997) look to both the U.S. and Japanese market and find that 17 percent of U.S. banks and seven percent of Japanese banks have significant foreign exchange exposure. This figure substantially increases to 30 percent and 10 percent respectively when daily data instead of monthly data is used. Koutmos and Martin (2003) also document significant foreign exchange exposure on cash flows from the financial sector for four out of the five currencies studied. The authors' suggest that this stems from the increased sale of currency derivatives by financial institutions for hedging purposes that lead to improved stock performance.

The results of Koutmos and Martin (2003) imply that the foreign exchange exposure of financial institutions potentially differs from other non-financial firms given the heterogeneous nature of their products and services. This suggests that financial institutions potentially possess significant financial and technical expertise over non-financial firms that allow for the superior structuring of operational and financial hedging using derivatives. Where this expertise is used for the risk management of both the bank and it's corporate clients, the foreign exchange exposure of both

parties should be reduced. One notable exception would arise when banks (and indirectly their corporate clients, given that some of the foreign exchange risk is transferred to the bank as credit risk) and insurance companies misuse derivatives to undertake and leverage even *greater* risky positions (Colquitt and Hoyt (1997)).[42]

In a study motivated by the rising incidences of large reported trading losses of banks and their corporate clients, Choi and Elyasiani (1997) investigate U.S. banks foreign exchange exposure and interest rate risk vis-à-vis derivative contracts. Given that the heterogeneous nature of the financial sector is such that not all financial institutions are likely to possess similar asset and cash flow exposure positions, Choi and Elysiani (1997) overcome the aggregation effects in the sample selection of an industry wide study by looking at individual banks, thus allowing for firm-specific effects to be accounted for. The use of a modified Seemingly Unrelated Technique (SUR) also adjusts for possible cross equation relationships that may bias conventional estimation results. They find that over 80 percent of U.S. banks from 1975 to 1992 to be significantly exposed. A link between banks' derivative currency contracts and foreign exchange exposure is established and is notably more influential compared to interest rate derivative contracts. However, the signs of the estimated foreign exchange coefficients are divided: 14 positive and 35 negative out of 49 significant coefficients. These differing signs merely reflect the unique asset

[42] For example, see *Far Eastern Economic Review*; "National Australia Stumbles: Australia's largest bank by market capitalization is hit by a foreign-exchange trading scandal; The bank will weather the storm, but its management may not" (05/02/04); and Choi and Elyasiani (1997). Allayannis and Ofek (2001) also investigate whether non-financial firms use derivatives for hedging or speculation and find that the use of currency derivatives significantly reduces foreign exchange exposure.

and cash flow positions of the different banks resulting in different exposure positions. Thus, any systematic incidences of overly risky behavior are not identified.

Other studies support the theory that the use of derivatives does serve to reduce the foreign exchange exposure of financial institutions. For U.S. banks, Chamberlain et al (1997) find a significantly negative coefficient between the exchange rate parameters[43] and their foreign exchange contracts dummy, suggesting that the use of foreign exchange contracts for hedging purposes does reduce the level of currency exposure. Koutmos and Martin (2003) suggest that sales of derivative products increase the profitability of the financial sector leading to better industry returns.

For the insurance industry, foreign exchange risk is one of the many risks that U.S. insurers face. With the increased internationalization of insurance operations, insurers have begun to undertake greater investments in foreign securities, either as a means to realize portfolio diversification benefits or to hedge foreign liabilities.

Thus far, there been no studies that focus on the foreign exchange exposure that insurance companies face, although there have been some work done in studying insurers and their risk management strategies. These include the use of derivatives to hedge interest rate and foreign exchange rate exposure, and the use of operational hedges to manage economic exposure (Colquitt and Hoyt (1997), Cummins, Phillips and Smith (1997), Hentschel and Smith (1997), Babbel and Santomero (1997), Bryis

[43] Based on the seven regressions of the exposure coefficient on different combinations of accounting measures, the two that contained the foreign contracts dummy returned significantly negative results.

and Varenne (1997), Koski and Pontiff (1999), and Cummins, Phillips and Smith (2001)).

Cummins, Phillips and Smith (1997) find that life and property-liability insurers tend to be the most active in foreign exchange derivative contracts. Colquitt and Hoyt (1997) also document high levels of participation by insurers in the derivatives market. In studying the participation and volume decisions of insurers in the derivatives market, Cummins, Phillips and Smith (2001) find that a factor influencing the decision to hedge lies in reducing the cost of financial distress and documents the use of derivatives by insurers to hedge volatility, liquidity and foreign exchange risks.

4.3 Empirical Hypotheses

Together with identifying currency exposure among U.S insurance companies, this chapter further tests several hypotheses to see if there exist any significance between different groups of insurers based on operational scope and size. Additional tests are also conducted based on short-term and long-term foreign exchange exposure. The premise for this is simple. Separating foreign exchange exposure into short-term and long-term horizons allows us to identify the if insurance companies focus more on short term transaction exposure management rather than the longer term economic exposure management. In separating international insurers from domestic insurers, the identification of systematic differences in the frequency of currency exposure based on the source of the exposure (whether direct exposure for the case of

international insurers, or indirect exposure for the case of domestic insurers) can also be revealed.

4.3.1 Operational Scope: Domestic and International Insurers

Much of the literature that looks at foreign activity and foreign exchange exposure use accounting based measures to proxy operational exposure (Chamberlain et al (1997), Allyannis and Weston (2001) and Choi and Kim (2003)). More recently, Martin and Mauer (2003) group U.S. banks according to whether they are domestic or internationally focused. The difference between these methods is that where the former method estimates the *extent* to which operational scope impacts on foreign exchange exposure, the latter allows us to identify systematic differences in the *type* (domestic versus international) of operations rather than the *scope*.

Chamberlain et al (1997) looks at cross sectional determinants of U.S. banks' foreign exchange exposure estimates using accounting based measures of currency risk. To proxy operational scope and hence foreign activity, they use net foreign assets are find a negative correlation with the estimated foreign exchange exposure coefficients. This implies that the larger the short foreign currency position, the greater the foreign exchange exposure. Allayannis and Weston (2001) classify firms into two samples depending on the existence of foreign sales. They find that for the firms with foreign sales, users of foreign currency derivatives do exhibit higher mean and median levels of Tobin's Q, reflecting higher firm value. Allayannis et al (2001) further find that firms with greater geographical scope tend to use more financial

rather than operational hedges, implying lower levels of foreign exchange exposure for international firms compared to domestic firms.

In terms of operational scope, conventional wisdom would suggest that internationally focused firms would face foreign exchange exposure whereas domestic firms would not. This however deals with the case of direct exposure. Where indirect exposure is considered, domestic firms may indeed be faced with foreign exchange exposure. These include the competitive effects foreign firms, and indirect cost exposure should the supplier of a domestic firm be exposed to direct foreign currency movements and pass on cost increases arising from a negative movement in exchange rates. Hentschel and Smith (1997), Chamberlain et al (1997) and Martin and Mauer (2003) agree that insurance companies and banks are indeed exposed to such indirect influences. This exposure arises from the nature of their assets, which are particularly sensitive to insolvency risk and could be dependant on the level of foreign exchange exposure. One simple example is that of a borrower who uses the money to undertake highly risky overseas investments. Here, his probability of default would then be a function of his foreign exchange exposure.

Existing literature documents that foreign exchange movements do have an impact on domestic companies (Wentz (1979), Hodder (1982), Jorian (1990) and Martin and Mauer (2003). Martin and Mauer (2003) find that U.S. domestic banks show significantly more frequent foreign exchange exposure than U.S. international banks. This supports the hypothesis of international firms hedging more in light of the more direct transactional and economic exposure that they face. Martin and Mauer (2003) place the foreign exchange risk of banks in the perspective of both direct and indirect

exposure. Where international insurers face both forms of exposure, domestic insurers are indirectly exposed to adverse foreign exchange movements via channels such as the solvency of its policyholders, reinsurance, and foreign competitive effects.

This chapter seeks to investigate if there exist differences in the frequencies of foreign exchange exposure between domestic insurers and international insurers. Following from existing literature, it is hypothesized that domestic firms will exhibit greater frequencies of foreign exchange exposure than international firms.

4.3.2 Size Effects and Foreign Exchange Exposure

The premise behind the size effect of firms' stem from them reaping the benefits of economies of scale and scope to achieve informational and cost savings in production, marketing, and in this case, foreign exchange exposure management.

Based on their findings, Chow, Lee and Solt (1997b) conclude that larger firms are better able to manage economic exposure to foreign exchange fluctuations by implementing operational hedges. Unlike transaction exposure management, this constitutes managing foreign currency inflows and outflows such that the net exposed amount is minimized. They credit this to operating, financial or informational scale economies that make it easier and more beneficial for larger firms to undertake the hedge.

Where the use of hedging results in lower foreign exchange exposure, Nance, Smith and Smithson (1993) suggests that larger firms tend to hedge more, suggesting larger firms have less exposure to currency risk, amongst others. This is not especially surprising given that larger firms would have significant cost economies of scale. Geczy et al (1997) find that larger firms are more likely to use foreign currency derivatives, suggesting economies of scale in risk management. Allayannis and Weston (2001) also suggest that large non-financial firms are more likely to use currency derivatives than small firms given the potentially large start up fixed costs of hedging. The authors' also find a positive relationship between currency derivative usage and firm value for international oriented firms. This is consistent to the findings of Chamberlain et al (1997) where increased derivatives usage leads to lower foreign exchange exposure. Thus, if larger firms tend to use more derivatives, and if increased derivatives use results in lower foreign exchange exposure, it follows that larger firms should exhibit lower foreign exchange exposure, *ceteris paribus*.

For financial firms, the literature surrounding size and foreign exchange exposure is still unclear. Chamberlain et al (1997) find that the largest U.S. banks generally exhibit larger foreign exchange exposure. This potentially stems from the role of many of these large banks as dealers in derivative contracts (this is also potentially true for insurers as some also act as market makers in derivatives) and suggests that the banks in their sample use their position as dealers in derivatives to undertake speculative positions. Thus, their finding contradicts the traditional view that larger derivatives usage should correlate with lower and not higher foreign exchange exposure (Allayannis and Weston (2001)). The fact that financial institutions are

different from non-financial firms in their use of derivative instruments due to their more central role in the derivatives markets could be the reason for the different result.

Specific to the insurance sector, Colquitt and Hoyt (1997) suggest that the size of an insurer could potentially have a positive or negative effect on the use of derivatives[44]. Literature on the cost of financial distress[45] finds that such costs are lower for smaller firms. Given that hedging the volatility of firm value reduces the probability of bankruptcy, the use of derivatives to hedge is arguably negatively related to firm size. On the other hand, informational economies and cost economies of scale could also potentially apply to insurers, indicating a positive relation with insurers' choice of hedging with derivatives.

Cummins, Phillips and Smith (1997) provide further evidence regarding the size effect on hedging in insurance. Their findings document greater usages of derivatives by insurers in the largest quartile (38 percent of life insurers, 20 percent of property-liability insurers and 35 percent of groups and unaffiliated insurers) as compared to insurers in the smallest quartile (less than 2 percent).

Consistent with the majority of the findings on the size effects and the hedging of foreign exchange exposure, this chapter hypothesizes that larger insurers will exhibit lower frequencies of foreign exchange exposure as small insurers due to larger

[44] This includes other forms of derivative instruments including those for managing foreign exchange exposure.

[45] Altman (1984).

hedging activities arising from informational and cost economies of scale in foreign exchange exposure management.

4.3.3 Time Horizon Effects: Short term and Long term Exposure

Chow, Lee and Solt (1997b) find that the foreign exchange exposure of the firms in their sample increases with the time horizon. They suggest this indicates short-term foreign exchange exposure effects are mitigated by the use of short-term transaction exposure strategies comprising the use of forwards, futures, swaps, options and other derivatives. As longer-term exposure is based more on economic exposure management using operational hedges and is more difficult to undertake, such exposure would thus me more pronounced.

Belk and Glaum (1990) conduct a survey of senior financial managers in 16 large British multinationals and find that firms consider transaction exposure more frequently than economic exposure. Their results are however not conclusive as out of the 16 firms, 6 did not attempt to hedge economic exposure, with the other ten using either foreign exchange derivatives or foreign currency denominated debt to hedge long term foreign exchange exposure. Only three firms indicate that foreign exchange exposure management is influential in non-financial decision-making, such as product development and location and sourcing. In another survey, Hakkarainen, Joseph, Kasanen and Puttonen (1998) also find that among Finnish Industrials, there exists a much greater propensity to hedge transaction exposure over than economic exposure. These results serve to demonstrate the lack of widespread management in hedging longer-term economic exposure.

Nguyen and Faff (2003) document the existence of both long and short-term exposure for Australian companies and link the time horizon nature of these exposure with the use of foreign currency derivatives. Their findings show that Australian firms are generally more exposed to long-term currency movements. They further find evidence that this in part could be due to the increased effectiveness of foreign currency derivatives in managing short-term currency movements over the longer-term economic exposure.

This chapter thus expects insurers to show significantly more frequent long-term rather than short-term foreign exchange exposure. Following Martin and Mauer (2003), this chapter classifies short-term exposure as those insurers with optimal lags of 4 or less (< 1 year) and long-term exposure as insurers with optimal lags of 8 lags or more (≥ 2 years) based on the AIC criteria of the polynomial distribution model, equation 4.3.

4.4 Methodology

The following sub sections briefly discuss the underlying theory and justifications behind some of the more important issues relating to the methodology used in this chapter. In doing so, they also provide an overview of some of the econometric issues regarding the formalized model and methodology to be discussed in more detail in the later sub sections.

4.4.1 Modeling Cash Flow Using a Seasonal Random Walk Model

In this study, the operating income before depreciation and foreign exchange adjustments measure (*OI*) is modeled using a seasonal random walk. The majority of existing literature studies foreign exchange exposure relative to firm value as measured by stock price returns (Jorian (1990), Bodnar and Gentry (1993), Amihud (1994), Bartov and Bodnar (1994), Choi and Prasad (1995), and He and Ng (1998)). This induces potential estimation difficulties in detecting foreign exchange exposure should investors not price the currency exposure correctly. This is made even more difficult given the asymmetry in information between corporate insiders and outsiders. The use of unanticipated operating income avoids this potential problem; additionally, it models the unexpected component of cash flows that would be due to foreign exchange volatility, which is the basis of foreign exchange exposure management by multinational firms' managers (Bodnar and Marston (1996)). The following provides a brief summary on seasonal random walk models and its relevance to the detection of foreign exchange exposure.

Consistent with Martin and Mauer (2003), this chapter models operating income before depreciation and foreign exchange adjustments using the seasonal random walk model, it is assumed that each season's values form an independent random walk, where *OI* is a function of the previous year's lag, denoted by a fourth quarter lag variable OI_{t-4} and represented by the following equation.

$$OI_{it} = \alpha_i + \theta_i (OI)_{i(t-4)} + \mu_{it}$$

Where α_i is the mean of the seasonal difference, the *average annual trend* in the data and is assumed constant. This seasonal trend model is a special case of an Autoregressive Integrated Moving Average (ARIMA) model where there is only one order of seasonal differencing, a constant and no other parameters. Because of the nature of the seasonal specification, one significant advantage of such a model is that it is relatively stable and will not be affected by sudden changes in the data within a 4-lag period.

4.4.2 Finite Distributed Lag Models and The Almon Lag Technique

The use of finite lag models in detecting exchange rate exposure in literature is well established[46]. Accordingly, to detect the presence of exchange rate exposure, this chapter uses a finite distributed lag model with the assumption that the coefficients are polynomially distributed according to a finite time lag known as the Almon lag.[47]

An Almon distributed lag model would take the form of,

$$y_t = \alpha + \sum_{i=0}^{q} \beta_i x_{t-i} + \varepsilon_t$$

[46]Bartov and Bodnar (1994). He and Ng (1998), Martin, Madura and Akhigbe (1999), Di Iorio and Faff (2000), Koutmos and Martin (2003), Martin and Mauer (2003), Choi and Kim (2003),

[47] Almon (1965).

Where the β_i coefficients are assumed to follow the following distribution:

$$\hat{\beta}_{iq} = \hat{a}_{0i} + \hat{a}_{1i}(q) + \hat{a}_{2i}(q)^2 + \hat{a}_{3i}(q)^3 + ...a_{li}(q)^k$$

Where k is the order of the polynomial and q is the number of lags.

One obvious potential problem with the use of the Almon lag technique is the presence of multicollinearity in the lagged regressors. Gudjarati (2003, pg 692) points out however that this potential problem of multicollinearity might in actuality be less serious as one would expect. In addition, this problem is mitigated due to the fact that the overall estimation accuracy of some combinations of parameter values need not be jeopardized. As an example, consider the OLS estimator of β in the multiple linear regression model,

$$Y = X\beta + \varepsilon$$

This estimator ceases to exist if two of the data columns in X are identical but least squares still provides an efficient estimator for the *combined* impact of the two explanatory variables. Their combined impact may be estimated by simply adding the two data columns together and proceeding with this smaller model. In terms of a finite distributed lag model, if we are satisfied with a reliable estimate of the total influence of the explanatory variables, $\beta = \beta_0 + \beta_1 + \beta_2 + ... + \beta_q$, then the following transformed model will provide an accurate estimation, where

$$Y_t = \alpha + \beta.Z_t,$$

And

$$Z_t = X_t + X_{t-1} + X_{t-2} + X_{t-q}$$

The use of the Almon lag model also possesses potential model mis-specification through the over or under-statement of the number of lags and the order of polynomial of the model. Understating the order of the polynomial would result in a bias in the estimation results since the model is insufficiently flexible to fully reflect the actual shape of the lag coefficients' distribution. Specifically, these lag coefficients will be constrained to a pattern that they do not in fact follow. An understatement of the number of lags will result in a direct omission of relevant variable bias. Such a mis-specification will undoubtedly lead to bias no matter what the order of polynomial is. Overstating the order of polynomial and lag length will also result in inefficient estimates since they introduce additional variables whose true contribution is zero.

4.4.3 Akaike Information Criterion (AIC)

In using the finite distributed lag model with the Almon lag, it is generally accepted that the principle of parsimony should be followed when choosing the number of lags to be use. As such, this chapter utilizes the Akaike Information Criterion (AIC) as the measure of parsimony with which to choose the most appropriate lag structure.

When choosing the number of lags to use, a balance is sought between increasing the explanatory power of the model (the 'fit') and the potential mis-specification problem of inefficiency by including irrelevant variables. Generally, the aim is to minimize inefficiency and maximize the fit of the model. This can be done by combining the goodness of fit of the model, as measured by the R^2, with a penalty factor to account for the number of regressors used. Thus, the AIC can be defined as

$$AIC = \left(\frac{2q}{n}\right) + \ln\left(\frac{\sum e^2}{n}\right)$$

Where q is the number of lags, e is the residual error term and n is the sample size. Thus, the AIC provides a means to differentiate between multiple models according to principle of parsimony.

4.4.4 Augmented Dickey-Fuller (ADF) Stationarity Test

The econometric importance of stationarity is recognized to be important to the inference and reliability of the estimated coefficients of a model. Essentially, A stationary time series is one whose statistical properties such as the mean, variance, etc, are all constant over time. Thus, in order to obtain meaningful statistics that are not simply reflections of a spurious regression relationship, it is important to ensure that the variables within the model used in this chapter all satisfy the assumption of stationarity.

The ADF test is one such way in which a variable can be diagnosed as a stationary or non-stationary series and looks for the presence of a unit root. There are three different models tested, allowing for various possibilities: a random walk with drift around a stochastic trend, a random walk with drift or a pure random walk process. The three models tested are given by

Model 1

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad \text{(Random walk with drift and stochastic trend)}$$

Model 2

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad \text{(Random walk with drift)}$$

Model 3

$$\Delta Y_t = \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad \text{(Random walk)}$$

In all three models, the null hypothesis is $\delta=0$, i.e. that there is a unit root, meaning that the series is *non-stationary*. The alternative hypotheses depend on the setup of the model, which could be that the series follows a deterministic trend, or is a random walk process. The test statistic used here is the τ (tau) statistic, which asymptotically does *not* follow a normal distribution and whose critical values follow the Monte Carlo simulations as established by Dickey and Fuller (1979). In all three cases, the tau statistic is different depending on the specification of the above models. In addition, the determination of the number of lagged differences is made empirically, just as in the above case of the finite distribution lag model. Similarly, the AIC is also used to identify the model with the optimal number of lags. The

inclusion of these lagged variables differentiates the ADF test from the simpler Dickey-Fuller (DF) test, although the ADF test statistic follows the same asymptotic distribution as the DF statistic. This distribution is only valid under the assumption of the residuals being uncorrelated and following a white noise process, $\varepsilon_t \sim iid(0,\sigma^2)$. The introduction of lagged variables would assist in ensuring that this is the case since ΔY_{tl} is likely to have an Autoregressive Moving Average (ARMA) representation.

4.4.5 Two-Sample Test of Population Proportions

In analyzing the empirical results detecting the presence of foreign exchange exposure, this chapter uses the two-sample *z*-test of population proportions to test the outlined hypotheses in Section 4.3. Generally, the hypotheses test differences in the frequencies of foreign exchange exposure between two different sub-samples. Similar studies that use the test of population proportions include Martin and Mauer (2003) and Nugyen and Faff (2003).

Here, the test statistic for the null hypothesis of H_0: $p_1 = p_2$ is given by:

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_p(1-\hat{p}_p)}\sqrt{(1/n_1)+(1/n_2)}}$$

Where the pooled sample proportion is:

$$\hat{p}_p = \frac{x_1 + x_2}{n_1 + n_2}$$

And p_1 is the proportion of significant foreign exchange exposure for sample A; p_2 is the proportion of significant foreign exchange exposure of sample B; x_1 and x_2 are the number of insurers that exhibit significant foreign exchange exposure for samples A and B respectively; and n_1 and n_2 are the sample sizes of samples A and B.

4.4.6 A Model for Detecting Exchange Rate Exposure

This study looks at how prevalent exchange rate exposure is, focusing on U.S insurance companies. Accordingly, 84 companies are identified and classified according to size and operational exposure (whether internationally oriented or domestically oriented). These insurers are then tested for exposure to seven different currencies, namely: the British Pound, Japanese Yen, Swiss Franc, the Dutch Guilder, France Franc, German Mark and Canadian Dollar.

The methodology used to estimate whether U.S. insurance companies exhibit exchange rate exposure follows a two-step approach. The unanticipated operating income for each firm and the foreign exchange variable are first estimated using a seasonal random walk model and log linear model respectively. These variables are then used in the main estimation model following the Almon distribution lag technique.

4.4.6.1 Obtaining the Unanticipated Operating Income (UOI) and FOREX variables

The unanticipated income before adjustments (UOI_{it}) variable is obtained using a seasonal random walk model as in Martin and Mauer (2003) and is obtained from the residuals of the following seasonal random walk model, where the four-quarter lagged values of each insurance company's operating income before depreciation and foreign exchange adjustments is regressed on current operating income before adjustments.

$$OI_{it} = \alpha_i + \theta_i(OI)_{i(t-4)} + \mu_{it} \qquad (4.1)$$

The residuals divided by the standard deviation form UOI_{it}, the standardized unanticipated operating income variable which is used in the formalized model estimation model to be discussed subsequently.

The OI_{it} variables for all insurance companies are first tested for the presence of unit roots. This ensures the stationarity of the residuals and consequently the UOI_{it} variables. Doing so protects the formalized estimation model from having spurious regression results. Where a company exhibits non-stationary OI_{it}, the first difference of the OI_{it} variable in equation 4.1 is used instead. Since the *unanticipated* operating income (i.e. the residuals of equation 4.1) is what this stage is estimating, doing so does not change the economic meaning of the residuals for the first difference model, thus ensuring the consistency across the whole sample of insurance companies.

This chapter measures the foreign exchange variable, *FOREX,* by the residuals of equation 4.2 as shown below. It represents the unexplained change in foreign exchange rates where the natural log of foreign exchange movement is modeled as a function of the natural log of interest rate differentials and economic output differentials. This is consistent with the use of unanticipated change in exchange rates in existing literature (Jorian (1990), Eiteman, Stonehill and Moffet (1992), Chow, Lee and Solt (1997a and 1997b) and Martin and Mauer (2003)) and provides a suitable basis for comparison. This chapter uses the following model:

$$LOG(FX_{jt}) = a_{jt} + \phi_{1\,jt} LOG(IR_{jt}) + \phi_{2\,jt} LOG(OP_{jt}) + forex_{jt} \qquad (4.2)$$

Where,

$$FX_{jt} = \frac{E_{jt}}{E_{j(t-1)}}$$

$$IR_{jt} = \frac{INT_{jt}}{INT_{U.S,t}}$$

$$Op_{jt} = \frac{GDP_{jt} \big/ GDP_{j(t-1)}}{GDP_{U.S,t} \big/ GDP_{U.S,(t-1)}}$$

To proxy foreign exchange movement, FX_{jt} is used to represent the relative change in spot exchange rates, given by the ratio of $E_{jt,}$ the exchange rate for country j / U.S dollar at time t to $E_{j(t-1)}$. The IR_{jt} variable represents the parity condition regarding spot interest rates given by the ratio of INT_{jt} and $INT_{U.S,t}$, which are the short-term interest rates for country j and the U.S at time t respectively. The OP_{jt} variable acts as

a proxy for the difference in the relative changes in economic output of country *j* and the U.S. Here, GDP_{jt} and $GDP_{U.S,t}$ are the level of real economic activity in country *j* and the U.S respectively at time *t*. $forex_{jt}$ represents the residuals of the estimated model, or the unexplained change in foreign exchange rates as represented by LOG(FX_{jt}).

Stationarity tests are also conducted for the three variables within equation 4.2 across the seven different currencies. For the IR_j variable, out of the seven currencies, three are diagnosed as having an I(1) process. Similar to the treatment of the OI_{it} variables, the first difference of the IR_j variable is used instead. Thus, given that our interest lies with the *unexplained* change in foreign exchange movement (the residuals of equation 4.2), taking the first difference will not change the economic meaning of that variable, ensuring consistency across the different currencies used.

4.4.6.2 The Formalized Exchange Rate Exposure Model

This chapter uses OLS regression analysis to determine the exchange rate exposure of U.S insurance companies. The model consists of estimating the sensitivity of unanticipated operating income before adjustments, UOI_{it}, to contemporaneous and lagged foreign exchange variables, *FOREX*. The formalized model to be used here follows the Almon distributed lag as discussed previously and is presented as:

$$UOI_{it} = c_i + \sum_{q=0}^{L_i} \beta_{iq} FOREX_{t-q} + \varepsilon_{it} \qquad (4.3)$$

Where UOI_{it} is the standardized unanticipated operating income before adjustment for depreciation and foreign exchange gains or losses, as a proxy for cash flow for insurer i in time period t; $FOREX_{t-q}$ is the percentage change in the *unexplained* exchange rate factor in time period t-q; c_i is the intercept for insurer i; β_{iq} are foreign exchange exposure coefficients, which represent the sensitivity of cash flows to short term and long term exchange rate changes (to be estimated), for insurer i with q, quarters 0 through L. Here, β_{iq} follows the Almon technique where L_i is the lag length, up to 12 quarters and determined by the Akaike criterion for insurer i; u_{it} is the stochastic error term.

As previously discussed in Section 4.4.2, it is very difficult to know the shape of the *FOREX* variable *a priori*. To that extent, this study leans upon the published work of Martin and Mauer (2003), where a third degree polynomial is used. Thus, it is assumed that the β_{iq}'s can be modeled by

$$\hat{\beta}_{iq} = \hat{a}_{0i} + \hat{a}_{1i}(q) + \hat{a}_{2i}(q)^2 + \hat{a}_{3i}(q)^3 \qquad (4.4)$$

Substituting equation 4.4 into equation 4.3, the model used for estimation is as below,

$$UOI_{it} = \alpha_i + a_{0i}Z_{0it} + a_{1i}Z_{1it} + a_{2i}Z_{2it} + a_{3i}Z_{3it} + \varepsilon_{it} \qquad (4.5)$$

Where

$$Z_{0it} = \sum_{q=0}^{L} FOREX_{i(t-q)} = FOREX_{it} + FOREX_{i(t-1)} + ... + FOREX_{i(t-L)}$$

$$Z_{1it} = \sum_{q=0}^{L} (q) FOREX_{i(t-q)} = (1) FOREX_{i(t-1)} + (2) FOREX_{i(t-2)} ... + (L) FOREX_{i(t-L)}$$

$$Z_{2it} = \sum_{q=0}^{L} (q)^2 FOREX_{i(t-q)} = (1)^2 FOREX_{i(t-1)} + (2)^2 FOREX_{i(t-2)} + ... + (L)^2 FOREX_{i(t-L)}$$

$$Z_{3it} = \sum_{q=0}^{L} (q)^3 FOREX_{i(t-q)} = (1)^3 FOREX_{i(t-1)} + (2)^3 FOREX_{i(t-2)} + (3)^3 FOREX_{i(t-3)} + ... + (L)^3 FOREX_{i(t-L)}$$

Using UOI_{it}, the coefficients a_0-a_3 in equation 4.5 are easily obtained via the usual OLS procedure. In this case, the estimates of α and a_0-a_3 have all the desirable statistical characteristics of ordinary least squares estimates should the stochastic error term satisfy all the classical assumptions as already outlined in Chapter Two Section 2.4.1. These coefficients are then used to calculate the β_{iq} coefficients of the formalized model, equation 4.3.[48]

4.5 Sample and Data Analysis

Sample quarterly data between the years 1990 to 2003 are used in this chapter. Operating profit before depreciation and foreign exchange adjustments are obtained from the research insight database by COMPUSTAT. Companies are identified according to their insurance GIC industry group code, and comprise insurance brokers, life and health, multi-line, property – casualty, and reinsurance companies.

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[48] Here, the standard errors for the coefficients of transformed model, a_0-a_3, are easily obtained from the regressions. These standard errors are then used to calculate the corresponding standard errors of the β_{iq} coefficients in equation 4.3 using the following formulae:

$$\begin{aligned} \text{var}(w_i(q)) &= \text{var}\left[\hat{a}_{0i} + \hat{a}_{1i}(q) + \hat{a}_{2i}(q)^2 + \hat{a}_{3i}(q)^3\right] \\ &= \sum_{j=0}^{3} (q)^{2j} \text{var}(\hat{a}_{ji}) + 2\sum_{j>p} (q)^{(j+p)} \text{cov}(\hat{a}_{ji}\hat{a}_{pi}) \end{aligned}$$

Under this classification, 210 companies are identified. In addition to the GIC industry group classification, the insurance companies are filtered according to availability of data; in this case, companies with more than 30 quarterly observations are used leaving 84 companies in the final sample. Exchange rate data (end of period)[49], interest rates and GDP are taken from the *International Financial Statistics* Database[50]. For countries that switched to the Euro in 1999, the exchange rates for these years are adjusted using the fixed exchange rate between the Euro and the domestic currency as obtained from the European Central Bank. To identify large companies versus small companies, the median asset value of each company is considered and asset sizes of greater than US$1 billion are classified as large. Companies are also classified under domestic or international according to data from the geographic segment of COMPUSTAT. For fiscal years ending after December 15, 1977, firms are required to report geographic segment data. These firms must report information for segments with assets, sales or profits that exceed 10 percent of consolidated totals. Where foreign sales data is not available, these companies are classified as being domestically focused.

The countries chosen for this study represent the main trading partners of the U.S. in terms of FDI in insurance. They are selected based on their significant contribution to the insurance sector of the U.S. Table 4.1 provides a summary on these main U.S partners in insurance. Using a measure of insurance activity given by the total

[49] Following Chamberlain et al (1997), Martin and Mauer (2003), this chapter uses nominal exchange rates. According to Choi and Kim (2003), for industrialized countries, the random walk and efficient markets hypotheses make both real and nominal exchange rates acceptable.

[50] This is with the exception of France and Canada, where complete real GDP figures were unavailable. These figures are instead obtained from the OECD published *Quarterly National Accounts* available at www.sourceoecd.org.

average U.S inflows and outflows of FDI in insurance for the years 2002 and 2001, it can be seen that the seven countries in this study make up more than 64.4 percent of total insurance activity with the U.S. Out of this, outflows dominate inflows with these seven countries accounting for a respectable 84.1 percent of overall outflows out of the U.S. This is in comparison to the smaller but no less significant figure for average total inflows of 50.4 percent. Globally, these markets represent almost 79 percent of world premiums, with the U.S. market alone accounting for 38.1 percent.

Table 4.1
Summary of Main U.S Partners in Insurance

	2001		*2002*		*Average*		
	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Total Insurance Activity
United Kingdom	5,126	40,710	9,064	47389	7,095	44,050	51,145
Japan	12,909	23,698	9,097	29,338	11,003	26,518	37,521
Germany	15,880	13,300	10,443	13,264	13,162	13,282	26,444
Switzerland	22,114	4,125	16,766	4,748	19,440	4,437	23,877
Netherlands	35,569	640	34,768	5449	35,169	3,045	38,213
France	28,873	2,283	32,015	2,183	30,444	2,233	32,677
Canada	25,289	26,055	25,332	23,498	25,311	24,777	50,087
Total	145,760	110,811	137,485	125,869	141,623	118,340	259,963
All Countries	174,109	225,556	162,853	244,480	168,481	235,018	403,499

Source: Survey of Current Business, Washington, Sep 2003; Vol.83, Iss.9

1) Numbers in US$ millions.

2) Inflows relate specifically to finance (except depository institutions) and insurance investments into the U.S. Outflows relate to U.S investments to external countries in the area of finance (except depository institutions), insurance and real estate

3) Total Insurance Activity given by the sum of average Inflows and average outflows for 2001 and 2002

4.5.1 Stationarity of Variables

To ensure meaningful results, it is important that the variables within the model exhibit stationarity. ADF tests for unit roots are conducted on all 21 variables contained in equation 4.2 for all countries. In addition, ADF tests are also done on the OI_{jt} variable in equation 4.1 for all insurance companies. Table 4.2 provides summary statistics regarding the stationarity of the OI, FX, IR and OP variables.

ADF tests find that all FX and OP variables were found to be stationary at the 10% level of significance. For the IR variable, all currencies were stationary except for Japan, Canada and Switzerland. Here, further testing confirm that these series are I(1) processes. Since taking the first differences does not change the economic interpretation of the residuals in equation 4.2, thus, the first difference of the IR variable is used for the Japanese, Canadian and Swiss models. ADF tests also find that the OI_{jt} variable for 54 out of the total sample of 84 insurers were non-stationary. For these non-stationary insurers, the first difference of the OI_{jt} variable in equation 4.1 is also used. Similar to the first differenced version of equation 4.2, the economic meaning of the residuals is left unchanged. Since it is this variable that is used subsequently, doing so maintains the consistency between both stationary and non-stationary models.

Table 4.2
Summary Stationarity Statistics on Key Variables

Panel A: Number of Insurers with Stationary and Non-Stationary Operating Income (OI)

	Number of Insurers	Stationary	Non-Stationary
All Insurers	**84**	**30**	**54**
Life	*13*	*4*	*9*
Non-Life	*71*	*26*	*45*
Domestic Insurers	**68**	**28**	**40**
Life	*11*	*4*	*7*
Non-Life	*57*	*24*	*33*
International Insurers	**16**	**2**	**14**
Life	*2*	*0*	*2*
Non-Life	*14*	*2*	*12*

Panel B: Breakdown of Stationary and Non-Stationary Foreign Exchange Variables

$$FX_{jt} = E_{jt} / E_{jt-1};$$

$$Op_{jt} = (GDP_{jt} / GDP_{jt-1}) / (GDP_{U.S,t} / GDP_{U.S,t-1});$$

$$IR_{jt} = INT_{jt} / INT_{US,t};$$

	FX_{jt}	IR_{jt}	OP_{jt}
United Kingdom (UK)	stationary	stationary	stationary
Japan (YEN)	stationary	non-stationary	stationary
Switzerland (SWZ)	stationary	non-stationary	stationary
Netherlands (NETH)	stationary	stationary	stationary
France (FRA)	stationary	stationary	stationary
Germany (GER)	stationary	stationary	stationary
Canada (CAN)	stationary	non-stationary	stationary

Panel C: Composition of Insurers According to Size and Operational Scope.

	Domestic (N=68)	International (N=16)
Small(N=41)	38	3
Large (N=43)	30	13

4.6 Empirical Results

This section discusses the findings as to the extent of currency exposure of U.S multinational and domestic insurance companies and their implications relating to existing literature.

Table 4.3 provides regression results for the estimation of the foreign exchange variable used to detect exposure. Cross correlations between the $LOG(IR_{jt})$ and $LOG(OP_{jt})$ variables are examined to identify potentially severe multicollinearity. As can be seen, multicollinearity is not severe. In all cases, the adjusted R^2 range between 0.88 for the United Kingdom to 0.99 for France, indicating the suitability of the model, with the explanatory variables explaining a significant portion of foreign exchange variation. Diagnostic tests using for the regressions of all seven currencies also confirm the absence of heteroscadesticity and autocorrelation as well as the normality of the residuals. This is especially important, as the residuals make up the foreign exchange exposure variable used in the formalized estimation model.

4.6.1 Overall Results: All Insurance Companies

The main focus of this study is to investigate the pervasiveness of foreign exchange exposure among U.S. insurance companies. To this end, the results are especially revealing. Table 4.4 reports the frequencies of foreign exchange exposure of U.S. insurers detected by this study based on the estimation of equation 4.3 using the Almon lag technique. As can be seen, substantial portions of all insurers are exposed to foreign exchange exposure. Specifically, 71 percent are exposed to the British

Pound, 70 percent to the Japanese Yen, 54 percent to the Swiss Franc, 42 percent to the Dutch Guilder, 57 percent French Franc, 60 percent to the German Mark and 37 percent to the Canadian Dollar. In addition, 99 percent of insurers are exposed to at least one currency. Compared to the banking literature, these frequencies are consistent with Choi and Elyasinai (1997) but proportionately higher than Chamberlain et al (1997), Choi and Kim (2003) and Martin and Mauer (2003) amongst others. This suggests that among financial institutions, operational and cash flow exposure is higher for insurance companies than banks due to lower levels of financial and operational hedging. This result could also point to other systematic differences in the risk profile between insurers and banks.

4.6.2 Life and Non-Life Insurers

Existing literature has so far neglected to investigate differences in the currency risk profile between life and non-life insurance. This is examined for the first time in this chapter, with the frequency of foreign exchange exposure detected for life and non-life insurers presented in Table 4.5. As can be seen, the frequencies of exposure are quite similar, with 85 percent of life insurers exhibiting significant foreign exchange exposure to the British Pound, 62 percent to the Japanese Yen, 46 percent to the Swiss Franc, 31 percent to the Dutch Guilder, 46 percent to the French Franc, 54 percent to the German Mark and 38 percent to the Canadian Dollar. For non-life insurers, the frequencies are: 69 percent to the British Pound, 72 percent to the Japanese Yen, 55 percent to the Dutch Guilder, 44 percent to the Swiss Franc, 59 percent to the French Franc, 61 percent to the German Mark and 37 percent to the Canadian Dollar. The z test of population proportions is used to compare between

life and non-life insurers and the results indicate that there are no statistical differences between the frequencies of exposure for life and non-life insurers. This suggests that the underlying transactional and operational exposure of life and non-life insurers are similar.

Exposure frequencies are also categorized according to operational scope and presented in Panels B and C of Table 4.5. Consistent with the above conclusion, no statistically significant differences in exposure proportions are found between domestic and international life and non-life insurers.

4.6.3 Operational Scope Effects: Currency Exposure of International and Domestic Insurance Companies

In addition to the exposure frequencies of all insurers, Table 4.4 also groups the incidences of exposure according to domestic and international activity. This is consistent with previous studies that look at U.S. companies with foreign operational exposure taking into account unique firm-specific operational characteristics (Choi and Kim (2003) and Martin and Mauer (2003)). Domestic insurers seem to exhibit greater exposure to foreign exchange movements than internationally oriented insurers. The frequency of their exposure is 78 percent for the British Pound, 74 percent for the Japanese Yen, 56 percent for the Swiss Franc, 47 percent for the Dutch Guilder, 59 percent for the French Franc, 63 percent for the German Mark and 38 percent for the Canadian Dollar. More importantly, all of the domestic insurers demonstrate significant foreign exchange exposure to one or more of the seven currencies. This is not surprising given that these currencies represent the seven most

significant trading partners with the U.S. in terms of insurance. The high frequency of foreign exchange exposure further serves to highlight the importance of these currencies to the cash flows of U.S. insurance companies. In addition, the high frequencies also confirm prior studies that suggest domestic firms do have exposure to foreign exchange fluctuations (Wentz (1979), Hodder (1982), Jorian (1990) and Martin and Mauer (2003)).

Internationally oriented insurers seem to show lesser frequencies of foreign exchange exposure. These include 44 percent for the British Pound, 56 percent for the Japanese Yen, 44 percent for the Swiss Franc, 19 percent for the Dutch Guilder, 50 percent French Franc, 44 percent for the German Mark and 31 percent for the Canadian Dollar. For exposure to at least one currency, 94 percent of internationally oriented insurers exhibit significant foreign exchange exposure.

Comparing between domestic and international insurers, the results show that domestic insurers do show more frequent foreign exchange exposure than international insurers at the one percent and five percent level of significance for the British Pound and Dutch Guilder respectively. In addition, for companies that are significantly exposed to one or more currencies, the z test also confirms that domestic insurers are exposed more frequently than international insurers. This is consistent with existing literature (Allayannis and Weston (2001) and Martin and Mauer (2003), and suggests that insurers with greater international operational exposure are more willing to hedge foreign exchange exposure given the recognition of their direct transactional and economic exposure to adverse changes in exchange rates. In addition, to control for size effects, the sample is further grouped into small

and large domestic insurers[51]. The results from Table 4.6 corroborate the prior results on operational scope, that international insurers are more likely to hedge foreign exchange exposure in light of greater direct operational risk to cash flows.

4.6.4 Size Effects: Currency Exposure of Small and Large Insurers

The investigation of potential size effects on the frequency of foreign exchange exposure for U.S. insurers follows from previous studies that have documented economies of scale in managing foreign exchange exposure (Nance, Smith and Smithson (1993), Chamberlain et al (1997), Chow, Lee and Solt (1997b), and Colquitt and Hoyt (1997), amongst others). Given the limited number of insurers in the sample, firms are grouped into only two categories, small and large, where insurers of asset size of US$1bn and more are classified as large. Table 4.7 provides the frequency of foreign exchange exposure for these two categories. The incidences of foreign exchange exposure found are generally high; frequencies for small insurers are 73 percent for the British Pound, 68 percent for the Japanese Yen, 68 percent for the Swiss Franc, 44 percent for the Dutch Guilder, 52 percent for the French Franc, 59 percent for the German Mark and 49 percent for the Canadian Dollar. Notably, 95 percent of small insurers are exposed to at least one currency.

[51] Here, only large and small insurers are reported since the lack of sufficient small international insurers (N=3) prevents a statistically meaningful comparison.

As expected, large insurers are found to have proportionately smaller frequencies of foreign exchange exposure. These include 70 percent for the British Pound, 72 percent for the Japanese Yen, 40 percent for the Swiss Franc, 40 percent for the Dutch Guilder, 60 percent for the French Franc, 60 percent for the German Mark and 26 percent for the Canadian Dollar. Interestingly, large insurers however show a higher frequency of foreign exchange exposure to at least one currency than small insurers of a 100 percent; however, the difference is not statistically different from zero.

The z test results confirm the validity of the size effect as documented in previous studies (Chow, Lee and Solt (1997b), Cummins, Phillips and Smith (1997), Colquitt and Hoyt (1997)). The z statistics for Large versus Small are significant for both Swiss and Canadian currencies. The lower frequencies of foreign exchange exposure for larger insurers supports the theory that large insurers benefit from informational and cost economies which results in increased hedging strategies to manage unexpected movements in these bilateral exchange rates.

As a further robustness check, the sample of small and large insurers are broken down into small domestic and large domestic insurers. This produces a more comparable sample taking out the potential noisy effects of an unbalanced composition of insurers within the small and large category. The lack of sufficient numbers of small international insurers unfortunately prevents this chapter from making any statistical comparisons between small and large international insurers. The results as presented in Table 4.8 do not show any significant differences in the frequencies of foreign exchange exposure for small and large domestic insurers.

Thus, given the evidence presented in Tables 4.7 and 4.8, the combined results provide only limited success in demonstrating the size effect on insurers' hedging activity. Further investigation is warranted using more detailed cross-country samples or foreign data.

4.6.5 Time Horizon Effects: Short and Long Term Exposure

Panel A in Table 4.9 present the frequencies of foreign exchange exposure for all insurance companies according to whether long-term or short-term foreign exchange exposure is detected. For the British Pound, 53 percent of insurers with long-term optimal lags exhibit significant foreign exchange exposure compared to 50 percent of those with short-term optimal lags. These are followed by 63 percent with long-term exposure versus 35 percent with short-term exposure for the Japanese Yen. For the Swiss Franc, 30 percent of insurers with both long-term optimal lags and short-term optimal lags are significant. 50 percent of insurers with long-term optimal lags are significant for the Dutch Guilder versus 19 percent for those with short-term optimal lags. The remaining significant exposure consists: the French Franc, 61 percent for long-term versus 30 percent for short-term; German Mark, 55 percent for long-term versus 35 percent for short-term; and the Canadian Dollar, with 44 percent for short-term and 19 percent for long-term.

Panel B provides the findings for domestic insurers. The results are similar with an average of 53 percent of insurers with long-term optimal lags showing significant exposure. This is in comparison to an average of 33 percent for insurers with short-term optimal lags.

Panel C shows that very few international insurers exhibit long-term optimal lags. This in part could be sample specific given the small number of international insurers in the sample. Thus, given the data limitations, this chapter can only conclude that short-term and long-term currency exposure does seem to be present in international insurance companies.

Consistent with Chow, Lee and Solt (1997b) and Nguyen and Faff (2003) and Martin and Mauer (2003), this chapter finds that the frequency of foreign exchange exposure increases with the length of the time horizon. This supports the theory that firms tend to be more exposed to long-term exposure given the ease with which short-term exposure can be hedged using currency derivatives. Tests of proportions indicate that for the Japanese Yen, Dutch Guilder, French Franc and Canadian Dollar, firms with long-term optimal lags show significantly greater frequencies of foreign exchange exposure than those with short-term optimal lags. In addition, these results agree with Pantzalis, Simkins and Laux (2001) in that they suggest insurers are more prone to long term operating exposure instead of the more short-term transaction exposure, which are more easily hedged with derivatives. It also verifies the survey results by Belk and Glaum (1990) and Hakkarainen, Joseph, Kasanen and Puttonen (1998) on the preference of firms to hedge short-term transactional exposure with currency derivatives over longer-term economic exposure given that such economic exposure is much harder to access and measure and hence hedge against as compared to derivative instruments.

Table 4.10 provides further evidence on time horizon effects. For all currencies, both small and large insurers with long-term optimal lags show significantly more foreign

exchange exposure as compared to those insurers with short-term optimal lags. This is consistent with the previous findings that for both categories of all insurance companies and domestic insurance companies, long-term exposure occurs more frequently than short-term exposure for four out of seven currencies. This lends credence to the above theory on the hedging preferences by firms and applies it to both large and small insurers.

Thus, this section's results show that the frequency of foreign exchange exposure increases with the time horizon. They confirm the theory that longer-term foreign exchange exposure requires economic exposure management via operational or natural hedges (Chow, Lee and Solt (1997b)). For firms with international exposure, such hedges are much harder to undertake compared to using currency derivatives for transactional exposure management in light of the difficulty in ascertaining the value to hedge, as well as significant costs needed for the restructuring of foreign currency inflows, outflows and foreign currency assets and liabilities. Domestic insurers also show significantly more frequent long-term than short-term exposure. This indicates that the same difficulty exists for domestic insurers given the difficulty in accessing long-term exposure without the option of undertaking operational hedging via the restructuring of foreign assets, liabilities and cash flows. In addition, the channel of foreign exchange exposure would be more indirect than direct, making the task of domestic risk managers even more difficult.

4.7 Conclusion

This chapter extends existing literature by documenting the pervasiveness of foreign exchange exposure in the U.S. insurance industry. In addition, several hypotheses are tested to determine if operational scope, firm size and the time horizon of exposure have an impact on the frequencies of foreign exchange exposure faced by U.S. insurers. The majority of existing literature looks at foreign exchange exposure on an aggregate level, which potentially masks the identification of currency exposure. This chapter conducts individual firm regressions that allows for the heterogeneous nature of individual insurer's economic linkages based on the methodology of Martin and Mauer (2003) with some minor innovations.

The results highlight the importance of exchange rate exposure management within the U.S. insurance industry. A large proportion of insurers show significant foreign exchange exposure to the each of the seven currencies under study and to at least one currency. The existence of any differences in the foreign exchange exposure of life and non-life insurers is also investigated for the first time. This chapter finds that for the seven currencies, there does not appear to be any difference in the frequencies detected, suggesting similar risk exposure management strategies between life and non-life insurers.

Evidence supporting several key theories from the existing literature on foreign exchange exposure and currency risk management is provided in this chapter. The operational scope of U.S. insurers does affect their level of foreign exchange exposure. Evidence on the significance of foreign exchange exposure to domestic

and international insurers is presented and the presence of both direct and indirect exposure faced by insurers as found by Martin and Mauer (2003) is further verified. For insurers, this is potentially due to the marketing of innovative bank-like products by insurers such as foreign currency endowment policies and other investment products that offer investors exposure to foreign markets. Comparing between domestic and international insurers, domestic insurers show significantly greater frequencies of foreign exchange exposure for the British pound and Dutch guilder and to at least one currency. This supports the theory that international firms tend to hedge more given that their exposure is more easily identified. Domestic firms on the other hand exhibit greater economic exposure since the indirect exposure they face are even more difficult to ascertain and execute.

Regarding the size effect, this chapter finds limited success in documenting such an effect on foreign exchange exposure in the U.S. insurance industry. For two of the currencies studied, larger insurers are found to demonstrate less frequent significant foreign exchange exposure than small insurers. The lower frequencies of foreign exchange exposure for larger insurers support the theory that large insurers benefit from informational and cost economies which result in superior hedging strategies to manage unexpected movements in these bilateral exchange rates.

Foreign exchange exposure is also separated according to short and long-term horizons. It is found that the number of significant foreign exchange exposure faced by insurers increases with the time horizon. In accordance with existing literature, this result suggests that U.S. insurers tend to focus more on hedging short-term transactional exposure with derivatives rather than longer-term operational exposure.

It corroborates the theory that the management of short-term foreign exchange transaction exposure is the more popular choice among financial risk managers.

This chapter provides several key contributions by extending and relating the literature on foreign exchange exposure and currency risk management to the U.S. insurance industry. It applies a new cash flow based methodology as innovated by Martin and Mauer (2003) that is useful in detecting the presence of foreign exchange exposure to specific currencies, neglecting the deleterious effects of using aggregate data. The main trading partners of the U.S. in insurance services are chosen and to that extent, high frequencies of foreign exchange exposure are detected. However, this is merely a starting point in understanding the determinants and extent of foreign exchange exposure in international insurance markets. Further research is warranted in investigating the extent of the size effect in insurance. Given the differences between the financial and non-financial sector, the determinants of foreign exchange exposure based on finance industry-specific and insurance industry-specific data should be investigated. To that extent, advances made in data collection under the GATS typology of trade in international financial services have been helpful for further research. Comparisons between different lines of insurance and different product groups can be also be conducted. Finally, data availability notwithstanding, potential insurance specific variables include reinsurance, insolvency risk, competitive effects, penetration rates, withdrawal rates, as well as other industry-specific variables.

Table 4.3
OLS Regression Results for Foreign Exchange Movement

Table 4.3 presents the regression results for the estimation of the FOREX variable with t-statistics given in parentheses.. The FOREX variable is defined the unexpected change in foreign exchange movements and measured by the residuals from $LOG(FX_{jt})=a_{jt}+\Phi_1 LOG(IR_{jt})+\Phi_2 LOG(Op_{jt})+forex_{jt}$. *Where*

$FX_{jt}=E_{jt}/E_{jt-1;}$

$IR_{jt}=INT_{jt}/INT_{US,t;}$

$Op_{jt}=(GDP_{jt}/GDP_{jt-1})/(GDP_{U.S,t}/GDP_{U.S,t-1})$.

	Constant	LOG(IR)	LOG(OP)	*Diagnostics*				Cross correlation between
				Adjusted R-Squared	LM Het Test	DW	JB	LOG(IR) and LOG(OP)
United Kingdom (UK)	-0.0002	-0.0012	-0.8388	0.8824	2.4888	1.9395	0.0054	-0.0087
	(-0.04708)	(-0.1652)	(-19.4180)***					
Japan (YEN)	-0.0026	0.0028	-1.0104	0.9590	0.3631	1.8193	0.8341	-0.0281
	(-1.3366)	-0.7495	(-33.1574)***					
Switzerland (SWZ)	-0.0041	-0.0012	-0.9836	0.9861	0.5463	2.2004	1.5442	0.2213
	(-4.0699)***	(-0.5919)	(-56.1573)***					
Netherlands (NETH)	-0.0047	0.0057	-0.9819	0.9887	0.0012	1.5544	0.2309	0.1164
	(-4.8257)***	-1.2138	(-66.7375)***					
France (FRA)	-0.0025	-0.0076	-0.9798	0.9907	0.2559	1.7979	0.5435	0.1618
	(-2.6738)***	(-3.7722)***	(-72.1248)***					
Germany (GER)	-1.60E-03	-3.10E-03	-9.66E-01	0.9879	0.5100	1.7854	0.9245	0.1419
	(-1.6451)	(-1.8854)*	(-62.382)***					
Canada (CAN)	-0.0001	-0.0036	-0.9507	0.9630	0.2926	1.6428	0.6758	0.1876
	(-0.1262)	(-0.5965)	(-36.6533)***					

*Indicates 10 percent level of significance, ** Indicates 5 percent level of significance and *** Indicates 1 percent level of significance

JB – Jarque-Bera test statistic for normality, LM – Lagrange Multiplier test for heteroscedasticity, DW - Durbin Watson test for autocorrelation

Table 4.4

Summary of Overall Results including Operational Effect on Currency Exposure: International versus Domestic

*Figures represent the number of insurers' with significant exchange rate exposure with the sample proportion in parentheses. Currency exposure is defined at the 10% level of significance. The z statistics are based on the test of proportions where *, ** and *** represent the 10%, 5% and 1% levels of significance respectively.*

	All Insurance Companies (N=84)	Domestic Insurance Companies (N=68)	International Insurance Companies (N=16)	*Domestic vs International z-statistic*
United Kingdom (UK)	60 (71%)	53 (78%)	7 (44%)	2.72***
Japan (YEN)	59 (70%)	50 (74%)	9 (56%)	1.36
Switzerland (SWZ)	45 (54%)	38 (56%)	7 (44%)	0.88
Netherlands (NETH)	35 (42%)	32 (47%)	3 (19%)	2.06**
France (FRA)	48 (57%)	40 (59%)	8 (50%)	0.64
Germany (GER)	50 (60%)	43 (63%)	7 (44%)	1.43
Canada (CAN)	31 (37%)	26 (38%)	5 (31%)	0.52
At Least One Currency	83 (99%)	68 (100%)	15 (94%)	2.07**

Table 4.5

Life and Non-Life Insurers' Currency Exposure

Figures represent the number of significant insurers out of the total number found to have the optimal number of lags within the defined time frame. Here, long term is defined to consist of 8 quarters or more (≥ 2 years) and short term is defined to consist of 4 quarters or less (≤ 1 year). Comparisons between samples are based on the z-test statistic of population proportion.

Panel A: Summary of Exposure of All Life and Non-Life U.S Insurers			
	All Insurance Companies		
	Life	*Non-Life*	*Life vs Non-Life*
	(N=13)	*(N=71)*	*z-Statistic*
United Kingdom (UK)	11 (85%)	49 (69%)	1.14
Japan (YEN)	8 (62%)	51 (72%)	-0.75
Switzerland (SWZ)	6 (46%)	39 (55%)	-0.58
Netherlands (NETH)	4 (31%)	31 (44%)	-0.87
France (FRA)	6 (46%)	42 (59%)	-0.87
Germany (GER)	7 (54%)	43 (61%)	-0.45
Canada (CAN)	5 (38%)	26 (37%)	0.13

Panel B: Summary of Exposure of Domestic Life and Non-Life Insurers			
	Domestic Insurance Companies		
	Life	*Non-Life*	*Life vs Non-Life*
	(N=11)	(N=57)	*z-Statistic*
United Kingdom (UK)	10 (91%)	43 (75%)	1.13
Japan (YEN)	7 (64%)	43 (75%)	-0.81
Switzerland (SWZ)	5 (45%)	33 (58%)	-0.76
Netherlands (NETH)	4 (36%)	28 (49%)	-0.78
France (FRA)	5 (45%)	35 (61%)	-0.98
Germany (GER)	7 (64%)	36 (63%)	0.03
Canada (CAN)	4 (36%)	22 (39%)	-0.14

Panel C: Summary of Exposure of Life and non-Life International Insurers			
	International Insurance Companies		
	Life	*Non-Life*	*Life vs Non-Life*
	(N=2)	(N=14)	*z-Statistic*
United Kingdom (UK)	1 (50%)	6 (43%)	0.19
Japan (YEN)	1 (50%)	6 (43%)	0.19
Switzerland (SWZ)	1 (50%)	6 (43%)	0.19
Netherlands (NETH)	0 (0%)	3 (21%)	-0.73
France (FRA)	1 (50%)	7 (50%)	0.00
Germany (GER)	0 (0%)	7 (50%)	-1.33
Canada (CAN)	1 (50%)	4 (29%)	0.61

Note: The z test of sample proportion for Panel C: International Insurers, should be interpreted with caution due to insufficient sample size of international life insurers.

Table 4.6

Operational Scope Effect on Currency Exposure: Large Domestic Versus Large International

*Figures represent the number of insurers' with significant exchange rate exposure with the sample proportion in parentheses. Currency exposure is defined at the 10% level of significance. The z statistics are based on the test of proportions where *, ** and *** represent the 10%, 5% and 1% levels of significance respectively.*

	Large Domestic Insurers (N=30)	Large International Insurers (N=13)	*Domestic vs International z statistic*
United Kingdom (UK)	24 (80%)	6 (46%)	2.22**
Japan (YEN)	22 (73%)	9 (69%)	0.28
Switzerland (SWZ)	12 (40%)	5 (38%)	0.09
Netherlands (NETH)	14 (47%)	3 (23%)	1.45
France (FRA)	18 (60%)	8 (62%)	-0.09
Germany (GER)	19 (63%)	7 (54%)	0.58
Canada (CAN)	8 (27%)	3(23%)	0.25
At Least One Currency	30 (100%)	13 (100%)	.

Table 4.7

Size Effect on Currency Exposure: Small Insurers Versus Large Insurers

*Figures represent the number of insurers' with significant exchange rate exposure with the sample proportion in parentheses. Currency exposure is defined at the 10% level of significance. The z statistics are based on the test of proportions where *, ** and *** represent the 10%, 5% and 1% levels of significance respectively.*

	Small Insurers (N=41)	Large Insurers (N=43)	*Small vs Large z-statistic*
United Kingdom (UK)	30 (73%)	30 (70%)	0.35
Japan (YEN)	28 (68%)	31 (72%)	-0.38
Switzerland (SWZ)	28 (68%)	17 (40%)	2.64***
Netherlands (NETH)	18 (44%)	17 (40%)	0.41
France (FRA)	22 (52%)	26 (60%)	-0.63
Germany (GER)	24 (59%)	26 (60%)	-0.18
Canada (CAN)	20 (49%)	11 (26%)	2.20**
At Least One Currency	40 (95%)	43 (100%)	-1.03

Table 4.8

Size Effect on Currency Exposure: Small Domestic Versus Large Domestic

*Figures represent the number of insurers' with significant exchange rate exposure with the sample proportion in parentheses. Currency exposure is defined at the 10% level of significance. The z statistics are based on the test of proportions where *, ** and *** represent the 10%, 5% and 1% levels of significance respectively.*

	Small Domestic (N=38)	Large Domestic (N=30)	*Small vs Large z statistic*
United Kingdom (POUND)	29 (76%)	24 (80%)	-0.36
Japan (YEN)	22 (58%)	22 (73%)	-1.32
Switzerland (Swiss Franc)	21 (55%)	12 (40%)	1.25
Netherlands (Dutch Guilder)	13 (34%)	14 (47%)	-1.04
France (French Franc)	17 (45%)	18 (60%)	-1.25
Germany (Deutsch Mark)	18 (47%)	19 (63%)	-1.31
Canada (Dollar)	14 (37%)	8 (27%)	0.89
At Least One Currency	38 (100%)	30 (100%)	.

Table 4.9
Time Horizon Effect on Currency Exposure: Long and Short Term Exposure

Figures represent the number of significant insurers out of the total number found to have the optimal number of lags within the defined time frame. Here, long term is defined to consist of 8 quarters or more (≥ 2 years) and short term is defined to consist of 4 quarters or less (≤ 1 year). Comparisons between samples are based on the z-test statistic of population proportion.

Panel A: Summary of Long and Short Term Exposures of All U.S Insurers

	All Insurance Companies		
	Long Term	*Short term*	*Long vs Short*
			z-Statistic
United Kingdom (UK)	17 of 28 (53%)	22 of 44 (50%)	0.89
Japan (YEN)	20 of 32 (63%)	13 of 37 (35%)	2.27**
Switzerland (SWZ)	6 of 20 (30%)	17 of 56 (30%)	-0.03
Netherlands (NETH)	10 of 20 (50%)	11 of 59 (19%)	2.74***
France (FRA)	11 of 18 (61%)	15 of 50 (30%)	2.33**
Germany (GER)	11 of 20 (55%)	18 of 52 (35%)	1.58
Canada (CAN)	7 of 16 (44%)	12 of 63 (19%)	2.06**

Panel B: Summary of Long and Short Term Exposures of All Domestic Insurers

	Domestic Insurance Companies		
	Long Term	*Short term*	*Long vs Short*
			z-Statistic
United Kingdom (UK)	16 of 27 (59%)	18 of 33 (55%)	0.37
Japan (YEN)	17 of 27 (63%)	10 of 27 (37%)	1.91*
Switzerland (SWZ)	6 of 18 (33%)	13 of 43 (30%)	0.24
Netherlands (NETH)	10 of 20 (50%)	8 of 43 (19%)	2.57***
France (FRA)	11 of 17 (65%)	12 of 39 (31%)	2.37**
Germany (GER)	9 of 16 (56%)	16 of 41 (39%)	1.18
Canada (CAN)	7 of 15 (47%)	9 of 49 (18%)	2.21**

Panel C: Summary of Long and Short Term Exposures of All International Insurers

	International Insurance Companies		
	Long Term	*Short term*	*Long vs Short*
			z-Statistic
United Kingdom (UK)	1 of 1 (100%)	3 of 11 (27%)	N.A
Japan (YEN)	3 of 5 (60%)	3 of 10 (30%)	N.A
Switzerland (SWZ)	0 of 2 (0%)	4 of 13 (31%)	N.A
Netherlands (NETH)	0 of 0 (0%)	3 of 16 (19%)	N.A
France (FRA)	0 of 1 (0%)	3 of 11 (27%)	N.A
Germany (GER)	2 of 4 (50%)	2 of 11 (18%)	N.A
Canada (CAN)	0 of 1 (0%)	3 of 14 (21%)	N.A

Note: Due to an insufficient amount of insurers exhibiting long-term optimal lags preventing reasonable inferences, the z test of sample proportion for international insurance companies is not reported.

Table 4.10

Time Horizon Effects on Currency Exposure: Large and Small Insurers

Figures represent the number of significant insurers out of the total number found to have the optimal number of lags within the defined time frame. Here, long term is defined to consist of 8 quarters or more (≥ 2 years) and short term is defined to consist of 4 quarters or less (≤ 1 year). Comparisons between samples are based on the z-test statistic of population proportion.

Panel A: Summary of Long and Short Term Exposure of Large Insurers

	Large Insurance Companies (N=43)		
	Long Term	*Short term*	*Long vs Short*
			z statistic
United Kingdom (UK)	13 of 13 (100%)	10 of 22 (45%)	3.28***
Japan (YEN)	18 of 18 (100%)	5 of 17 (29%)	4.40***
Switzerland (SWZ)	7 of 7 (100%)	8 of 34 (24%)	3.83***
Netherlands (NETH)	6 of 6 (100%)	9 of 32 (28%)	3.31***
France (FRA)	8 of 8 (100%)	8 of 25 (32%)	3.35***
Germany (GER)	10 of 10 (100%)	11 of 28 (39%)	3.31***
Canada (CAN)	8 of 9 (89%)	3 of 34 (9%)	4.90***

Panel B: Summary of Long and Short Term Exposure of Small Insurers

	Small Insurance Companies (N=41)		
	Long Term	*Short term*	*Long vs Short*
			z statistic
United Kingdom (UK)	15 of 15 (100%)	11 of 22 (50%)	3.27***
Japan (YEN)	12 of 13 (92%)	8 of 20 (40%)	3.00***
Switzerland (SWZ)	13 of 13 (100%)	9 of 22 (41%)	3.50***
Netherlands (NETH)	13 of 14 (93%)	2 of 24 (8%)	5.14***
France (FRA)	9 of 10 (90%)	7 of 25 (28%)	3.33***
Germany (GER)	10 of 10 (100%)	7 of 24 (29%)	3.76***
Canada (CAN)	7 of 8 (88%)	9 of 29 (31%)	2.54***

CHAPTER 5

CONCLUSIONS AND FURTHER RESEARCH

5.1 Introduction

Multinational trade in financial services is growing in importance with the efforts of agencies such as the WTO and UNCTAD in furthering a more liberalized and integrated world economy. This trend reveals the pressing need for added research into issues relating to international financial risks and trade. In this regard, this thesis identifies several topics in international risk and insurance within the area of international financial services. To that extent, significant contributions are made to the literature on the demand for life insurance, FDI, and foreign exchange exposure of multinational corporations.

Extending on prior research in the area of life and non-life insurance, Chapter Two analyzes the impact of location-specific factors on the demand for life insurance in OECD countries. In addition, the determinants of foreign insurers' participation levels in life insurance markets are explored in Chapter Three, with significant findings and implications across the literature on life insurance demand, FDI in financial services and the international insurance establishment trade. Finally, this

thesis addresses the foreign exchange risks that U.S. multinational and domestic insurers face. An innovative cash flow based methodology by Martin and Mauer (2003) is applied and evidence provided as to the existence of foreign exchange exposure faced by U.S. insurers.

In this chapter, Sections 5.3 to Section 5.4 summarize the main findings and contributions of the three topics examined in this thesis. Following, Section 5.5 concludes this thesis by suggesting some potential avenues for further research.

5.2 Demand for Life Insurance in OECD Countries

Significant contributions are made to the demand and supply literature on life insurance demand based on this chapter's conclusions. Several models are tested, including individual year OLS and GMM estimations for years 1996 to 2000 and pooled OLS and GMM estimations. In addition, an innovated anticipated inflation variable is used based on the rational expectations approach by Chen, Roll and Ross (1986) and is found to be highly significant in the pooled OLS and GMM estimations. The results from the improved GMM methodology also show that income, social security expenditure, the dependency ratio and level of financial development are consistently significant over all the years tested in either one or both GMM models, with all possessing the correct hypothesized relationships in agreement with existing literature. In addition, pooled GMM estimations confirm the significance of all the variables with the consistent signs.

Thus, this chapter establishes that income, the dependency ratio, human capital endowment and financial development are positively related to demand for life insurance for the more developed economies as represented by the sample of OECD countries. Evidence supporting the negative relationships of anticipated inflation, life expectancy, foreign market share and social security expenditure with life insurance demand are also provided and are consistent with existing literature. Notably, in comparing the findings of Browne and Kim (1993) (where a *positive* relationship is found using a sample of international countries), the negative sign of social security found in this chapter suggests that the level of social security expenditure differs according to a country's stage of economic development. For more developed countries, social security reflects the level of national wealth. This results in a negative relationship with life insurance demand due to the substitution effect of wealth on the need for life insurance protection.

There are important policy implications from this chapter. The negative significance of foreign market share suggests that the underlying level of competition in the insurance market is important in influencing life insurance demand. Consequently, there are many benefits to be reaped from a more competitive market, including a greater variety of insurance products from more globally diversified foreign insurers as well as increased intra-industry and global trade linkages. Progress made in furthering financial development will also have benefits for the insurance industry. These can be brought about through the greater accumulation of financial expertise and skills that will allow for more innovation, resulting in a larger feasible set of investment options.

5.3 Foreign Participation in Life Insurance Markets

The investigation into the determinants that influence the level of foreign life insurers' participation has several important extensions to the literature on both FDI and demand for life insurance. In line with the eclectic theory on foreign expansion, this chapter documents the importance of both market structure and socio-economic variables in creating location-specific advantages that attract foreign insurer participation. The results of this chapter extend the literature on life insurance demand by providing a link between demand for life insurance and FDI in insurance services for the first time. To that end, the evidence presented in this chapter document the relevance and validity of the variables used in both the areas of life insurance demand and the international insurance establishment trade.

The market structure characteristics that influence the level of participation between foreign and domestic life insurers are found to be different. The results suggest that it is the level of openness and liberalization in the life insurance market that influences foreign life insurer participation. The underlying level of competition in the domestic life insurance market on the other hand influences domestic insurers.

To the extent that government regulations and restrictive trade policies affect foreign companies more directly than domestic companies, the above results are not particularly surprising. What is more interesting is that the results suggest that a systematic difference exists between life and non-life markets in lieu of the fact that for non-life markets, the competitiveness of the non-life market seems to be the driver of foreign participation instead of market openness and liberalization (Ma and

Pope (2003)). Skipper (1996) points out that a common objection to foreign insurer participation by regulators is that these foreign insurers may market insurance selectively to only the more profitable commercial sector or to multinational corporations (which would mainly consist of non-life insurance contracts), neglecting the retail market (generally consisting of life insurance and endowment policies). Thus, a possible reason for the different results could stem from the inherent differences between the life and non-life markets. The larger size of the life insurance sector compared to the non-life sector in both absolute and per capita terms across the majority of countries[52] (Swiss Re, Sigma, 2003, 8) is a potential explanation to this. A larger market represents a larger insurance opportunity. Thus, the *primary* barrier to a foreign insurer wanting to access such opportunities would be the level of openness and liberalization of the domestic life insurance market. Such market restrictions could potentially alter the profitability of the market to the foreign insurer, or exist as an outright ban on foreign involvement (Skipper (1996)). The opposite is potentially the case for non-life markets, where the main barrier would be the underlying level of competition in the non-life market. This is because the insurance opportunity would be more influenced by the level of competition in the domestic non-life market, being much smaller than the life insurance sector. This possible explanation is consistent with the results of Ma and Pope (2003) for non-life markets. The authors suggest that the negative significance of their profitability variable is possibly explained by higher premium taxes that are imposed by host governments on foreign non-life insurers. This potentially impedes the foreign

[52] This discrepancy is especially pronounced in most developed insurance markets such as Japan, the U.S. and Switzerland.

insurer's ability to compete effectively on price, leading to a reduction in the insurance opportunity presented to foreign insurers.

5.4 The Foreign Exchange Exposure: Evidence from the U.S. Insurance Industry

This chapter documents the significance of foreign exchange exposure that U.S. insurers face using a new innovative cash flow methodology as presented by Martin and Mauer (2003). Here, potential pitfalls in foreign exchange exposure detection such as the averaging effects of sample aggregation and investor mispricing (Bartov and Bodnar (1994)) are avoided using individual firm estimations and cash flow data instead of stock returns.

Using the Almon lag technique, the presence of foreign exchange exposure in the U.S. insurance industry is revealed, highlighting the importance of currency risk management strategies to U.S. insurers. The results show that a sizable proportion of all insurers demonstrate high levels of foreign exchange exposure, especially to one or more of the seven currencies studied (Pound, Yen, Swiss Franc, French Franc, German Mark, Dutch Guilder and Canadian Dollar).

Differences in the presence of foreign exchange exposure between the life and non-life sectors are also explored for the first time, with the results suggesting that the underlying transactional and operational exposure faced by both types of insurers are similar. In addition, this chapter finds evidence in support of three other main theories in the literature relating to foreign exchange exposure and hedging behavior.

Specifically, U.S. insurers that are domestically oriented show greater frequencies of foreign exchange exposure than their more geographically diverse international counterparts. This confirms the presence of an operational effect in exchange rate exposure management, and the theory that multinational firms tend to hedge more in the face of direct currency exposure. Given that the foreign exchange exposure faced by domestic insurers is more indirect in nature, this finding exposes an important issue in the area of foreign exchange risk management by suggesting that domestic firms should pay more attention to the management of such indirect currency exposure. One of the reasons for such an oversight potentially lies with the difficulty in identifying and measuring the various types of indirect effects from foreign exchange movements. It is no wonder that compared to the simpler and more direct transactional exposure, which can be easily hedged using derivative instruments, domestic insurers are failing to account for indirect exposure more adequately.

The above conclusion is supported when foreign exchange frequencies are separated according to the time horizon. Separating the horizons allow us to differentiate between short-term transactional exposure and longer-term economic exposure. It is found that as the time horizon increases, so does the frequency of foreign exchange exposure. This implies that the lower frequencies of short-term foreign exchange exposure faced by U.S. insurers arise from the increased hedging of short-term transaction exposure rather than the longer-term economic exposure. Thus, this finding supports the theory that for financial risk managers, the hedging of short-term transaction exposure is the more popular choice compared to economic and operational exposure since short-term transactional exposure is more easily

identifiable and can be hedged using currency derivatives while longer-term economic exposure is more difficult to access and measure. Taken with the previous finding on operational effects, this verifies the prior conclusion that domestic insurers tend to face more foreign exchange exposure over international insurers since a larger component of their foreign exchange exposure consists of indirect economic exposure that is harder to ascertain.

Finally, this chapter finds some success in documenting evidence supporting the size effect in foreign exchange exposure management. Larger insurers are found to demonstrate less frequent significant foreign exchange exposure than small insurers for two of the seven currencies studied. This is consistent with existing literature and suggests that insurers benefit from informational and cost economies, which result in superior hedging strategies to manage unexpected adverse movements in foreign exchange rates.

5.5 Suggestions for Further Research

While this thesis fills several gaps in the existing literature on 1) the demand and supply of life insurance; 2) foreign participation and the international insurance establishment trade; and 3) foreign exchange exposure and currency risk management; in other ways, it has also opened new avenues for further research.

5.5.1 Chapter 2: Extensions

Chapter Two analyzes demand determinants of life insurance in OECD countries. As a complement, possible factors influencing the supply side could be investigated. Potential variables here include trade barriers, governmental regulations and the availability of funds. The finding of a negative relationship of social security expenditure with life insurance demand also contrasts with the positive relationship as documented by Browne and Kim (1993) using a cross section of international countries. This suggests that the underlying impact of social security on life insurance demand potentially differs according to the stage of development of the economy. Further testing is required using disaggregate social security data on insurance benefit payments that were hitherto unavailable.

5.5.2 Chapter 3: Extensions

While Chapter Two succeeds in identifying the factors that influence the participation decisions of foreign insurers, there is still a lamentable lack of research in accessing these location choices of insurers in their decision to enter foreign markets. To that extent, event studies could be conducted based on efficiency and performance measures. The literature on M&A activity in insurance may provide some assistance, however, there is still much to be done. Akhige and Madura (2001) document the positive impact on both acquirer and target insurance companies' values. However, their study focuses on domestic insurance M&As while cross-border effects have yet to be researched. Although their domestic findings give a useful indicator as to what the performance effects of foreign participation may be,

cross-border issues such as cultural differences and integration issues arising from geographic segmentation make the outcome of such research an open empirical question. A suggested performance measure here would be an efficiency measure such as the Earnings Before Interest, Tax and Amortization (EBITDA) margin (given by EBITDA/Revenue, which proxy's earnings margin). To the extent that participation levels are defined as premium volume, there exists scope to explore the components that make up premium volume, namely, premium rates and volume (insurance cover). Premium rates are determined by the expected losses and costs of funds of the insurer and are thus influenced by interest rates and competitive factors. In extending this chapter, proxies for premium rates or expected losses can be included.

Further research is also warranted in the area of assessing the impact of foreign participation on life and non-life insurance markets. The development of insurance markets as measured by insurance penetration rates (premiums as a percentage of GDP) could be used as the dependent variable. This could be assessed in terms of foreign participation variables such as foreign premiums, FDI inflows and outflows in insurance services etc. The classifications of international trade in financial services by GATS provide a useful framework in which such research could be conducted.

5.5.3 Chapter 4: Extensions

Finally, Chapter Four identifies the prevalence of foreign exchange exposure in the U.S. insurance industry. This however is merely a starting point in understanding the

determinants and extent of foreign exchange exposure in international insurance markets. Given their unique roles as financial intermediaries, differences in the foreign exchange exposure between financial and non-financial firms have yet to be explored. This follows from studies such as Koutmos and Martin (2003) that have identified such disparities between these two sectors but have not gone further in identifying the source of these differences. The use of finance industry-specific and insurance industry-specific data would be helpful to that end. Should data be available, potential insurance specific variables include reinsurance, insolvency risk, competitive effects, penetration rates, withdrawal rates, as well as other industry-specific variables. Finally, comparisons between different lines of insurance and different product groups could be made.

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