論文の内容の要旨

論文題目　Essays on Dynamic Optimality of Bond Portfolios and Global Portfolios

債券ポートフォリオと国際分散投資の動学的最適性

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This paper consists of two parts. First, Chapter 1 and Chapter 2 formulate and analyze a dynamic optimization problem of bond portfolios in a continuous-time framework. Recently, the size of the world bond market is growing rapidly and bond portfolios have become increasingly important in asset allocation for both firms and individuals. For example, the institutions for the individual pension funds including individual retirement accounts (IRAs) and 401(k) plans prevail in financial markets. Managing bond portfolios is important partly because bonds are major instruments for pension funds. However, there were only a few studies that shed light on a dynamic optimal bond portfolio problem theoretically. Rather, most of the existing researches concentrated on the "asset allocation puzzle" pointed out by Canner, Mankiw, and Weil (1997); the inconsistency between a theoretical result in the static mean-variance framework and a popular investment advice in practice for the optimal choice of two classes of assets, bonds and stocks, in a portfolio. Thus, they did not pay much attention to the term structure of interest rates, and consequently did not utilize term structure models developed in the valuation of derivatives so well. We take a class of the term structure models which generate the current term structure by construction, which is a desirable feature especially in

liquid bond markets. Based on modelling the term structure of interest rates and the market price of risk, we formulate an investor's portfolio choice problem.

Among others, interest-rate expectations strategies and yield curve strategies are well-known in active bond portfolio management. We focus on these strategies in the first two chapters. In Chapter 1 we investigate the optimal interest-rate expectations strategies analytically and seek theoretical justification for a typical strategy which is recommended in practice under an expectation on the future level of interest rates. The argument about interest-rate expectations strategies often postulates a parallel shift in the yield curve. In a term structure model which induces such a shift, we obtain a dynamically optimal bond portfolio for an investor who has a CRRA utility function over intermediate consumption and the terminal wealth, utilizing the martingale approach by Cox and Huang (1989) and Karatzas, Lehoczky, and Shreve (1987). Then, we find the plausible result that for an investor who has a utility function over the terminal wealth and are more risk averse than those with a log utility function, the duration of the optimal bond portfolio should be shortened (lengthened) if the interest rate is expected to rise (fall).

Chapter 2 considers a dynamic optimization problem of bond portfolios within a certain class of the Markovian Heath-Jarrow-Morton term structure models proposed by Ritchken and Sankarasubramanian (1995). Applying the result in Ocone and Karatzas (1991), the general formula which the optimal bond portfolio should satisfy is derived. The formula exhibits the investor's demand can be decomposed into three parts; "MV (mean-variance) term," "IR (interest rate)-hedging term," and "MPR (market price of risk)-hedging term." Further, in the chapter we investigate optimal yield curve strategies analytically in the case of the extended Vasiček model as a special case and numerically in general cases where the parameter values are specified, based on Chan, Karolyi, Longstaff, and Sanders (1992) and Pearson and Sun (1994). We provide theoretical justification for a typical strategy, which is recommended in practice under an expectation on the change in the shape of the yield curve, that the bullet (barbell) strategy is preferable under the expectation of the steepening (flattening) change in the yield curve. In the numerical analysis, we utilize new technique based on the "asymptotic expansion approach" in order to increase efficiency in computation. We also confirm optimal yield curve strategies analytically in the case of a Gaussian two-factor term structure model developed by Hull and White (1994).

Second, both of Chapter 3 and Chapter 4 formulate and analyze a dynamic optimization problem of global portfolios with exchange risk in a continuous-time framework. Exchange risk poses a unique question in the field of international financial economics. Due to exchange risk, domestic investors and foreign investors evaluate the same asset differently. Foreign investors

must take account of the movement of the exchange rate as well as the rate of return of the asset from the viewpoint of domestic investors. Hence, the riskless asset for domestic investors is not riskless for foreign investors. Thus, there is no common riskless asset for all investors in the world. Investors face different investment opportunity sets according to their habitats. Therefore, it follows that exchange risk violates the assumption behind Tobin's separation theorem that every investor should face the identical opportunity set.

An important task in international financial economics is to find out some investment rules followed by investors in such a situation. In particular, the focus of Chapter 3 is currency hedging. Exchange risk exposure in a portfolio can be managed by combination of a long (short) position in a foreign risky asset with a short (long) position in a foreign riskless asset, and currency hedging demonstrates the amount of exchange risk investors will not take. We suppose all investors in the world choose global portfolios with exchange risk and no investment barriers, calculating the rate of return of a foreign asset by a linear approximation. Technically, the approximation corresponds to taking the logarithm in a discrete-time framework or to neglect of the quadratic variation in Itô's formula in a continuous-time framework. It is often used in exposition of interest rate parity and purchasing power parity, for instance. Then, by the approximation, the rate of return of a foreign asset is approximately equal to the sum of the rate of return of the asset for domestic investors and the the rate of change of the exchange rate. Hence, the approximation does not generate the relationship known as Siegel's (1972) paradox, a variety of Jensen's inequality in international financial economics, and leads to another two-fund separation theorem. The portfolio demand can be decomposed into two funds; (1) a common zero investment portfolio which includes all assets and (2) the riskless asset for each investor. Furthermore, we obtain an equilibrium hedge ratio with respect to a currency. We find the hedge ratio is independent from the habitat of the investor and closely related with the balance of capital account of the nationality of the currency. Compared with the hedge ratio calculated by Itô's formula, our hedge ratio marks the upper bound and has a desirable feature of observability.

Chapter 4 examines the effects of selective liberalization of capital flows, where some assets are freely traded by all investors in the world and the others are only by local investors, on asset pricing with exchange risk in a two-country model. Recent experience of capital flow controls in Malaysia is noticeable from the viewpoint of international investments. Given governmental capital flow controls, investors may face different investment opportunity sets according to their habitats even without exchange risk. Although issues of exchange risk and market segmentation are noted regarding international investments, they are liable to have been discussed separately. Most of previous studies on asset pricing with quantitative capital

flow controls assumed the global market structure where all assets in one country can be freely traded by all investors in the world. In contrast, we allow there are both accessible and non-accessible assets to foreign investors in a country. Utilizing the stochastic control approach initiated by Merton (1969, 1971), Samuelson (1969) and Solnik (1974) in the field of international financial economics, we investigate equilibrium asset pricing in various market structures. Consequently, we find the difference between equilibrium expected rates of return of two arbitrary freely traded assets is determined independently from whether other asset markets are open to foreign investors or not.