13-1

Part I

1a) In Roman times, the rules determined that the family estate would be usually left to the first born son. The Falcidian law stated the rightful heirs to an estate was entitled to at least one quarter of the property left by a testator, which was called "Falcidian fourth". However, there was a valuation problem because the bequests such as life income did not have observable market values. To solve the problem, the jurist Ulpian developed a table for the conversion of life annuities to annuities certain, but the interest payments were ignored. The life annuity, a form of investment dating at least to feudal time, evolved from the *census*. *Census* contracts in feudal times were originally used as barter arrangement which presented goods for future goods. According to canon law, usury was prohibited. Thus, all perpetual or 'heritable' *rentes* were considered redeemable in principle. The contact facilitated the evolution of a market for long-term debt in Continental Europe.

not exact

Census contract was an exchange for an agreement to make a stream of annual payments received by the sellers over time. By the end of the 15th century, the nobility, the church, the state and the landed gentry became the sellers of *census*. Various forms of *census* included life annuities, perpetual annuities and term annuities like mortgage. Both perpetual *census* and temporary or term *census* were offered to the buyers. Noonan estimates that credit raised using census arrangements may have exceeded that raised through *societas*. By the 16th century, investment securities were available in financial markets. The earliest forms of public debt were issued by Italy, such as the *prestiti* in Venice. In 1260, *rentes heritables* and *rentes vagieres* were developed in French, spreading to the Low Countries and German towns.

9.5

The debt market increased because sovereigns recognized the importance of the debt market in financing state military ventures. In the early 18th centuries, French national finances was in poor condition, while the Dutch was successful in developing its public debt. The Dutch was the pioneer of various innovations in public debt issues including the development of free market for *reten* issued. Later on, financial markets required more precise methods of valuing the life annuities and dealing with risk. Analytical solutions were introduced to solve the problem of valuing life annuities in the late 17th and early 18th centuries, such as De Witt's and Halley's solution.

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FONT too small.

1a) During 40BC, it was a social rule that inheritance would mean the eldest son would claim a sizeable portion of the family estate. To ensure other family members that are not directly entitled to the inheritance some sort of security, bequests such as usufructs, maintenances, and life incomes were commonly formed to resolute this matter. Under the Justinian dynasty, inheritance law was arbitrated by a manuscript called *Lex Falcidia de Legatis* (i.e., Falcidian Law). In this by-law, one component maintained that the rightful heir(s) to an estate was entitled to not less than one-quarter of the property left by a testator (i.e., Falcidian Fourth). Hence, this created a judicial quandary because legacies that exceeded ¾ of the total estate value had to be reduced proportionately. At the time, this was rather problematic because many types of bequest did not have observable market values. As a result, a Roman jurist Ulpian had to devise a table in which converted life bequests to annuities certain. Although Ulpian's Table provided fundamental insights, the accuracy of the valuations was questioned. For example, Bernoulli observed that by omitting the value of interest in the calculations, Ulpian's legacy valuations were frequently overvalued. Moving into the Dark Ages, religion began to play a significant role in Europe. Specifically, the Usury doctrine proposed by the church fathers in early 11th century deemed that the notion of interest payment on loaned money was un-Christian because "Money is sterile". This created massive problems for life contingency calculations because without interest payment; there was no sound methodology on valuating interest. Relating to the concept of exchange, citizens would often make bequests with churches and monasteries because in the case of tragedies, families could still secure some sort of future income. This form of transactions (i.e. census contracts) were preliminary for government debts that we have today. As time passed, the doctrine on usury evolved as payment on interest became permissible. For example, bill of exchange, loss to lender and *montes* were the few activities that the church gradually allowed for interest payments. The earliest life annuity contracts were issued in 1260, known as *rentes heritables* and *rentes vagieres* in French towns. This type of municipal finance slowly spread to Low countries and German towns. By the 16th century, municipalities, particularly in Holland, Flanders and Brabant, issued life and redeemable annuities leading to increasingly larger stocks of public debt.

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