

Put-Call Parity and Approaches to Usury in Medieval Contracting

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Abstract

Financial derivatives, including options, are usually presented as a “new” development in finance. Certainly, such things as Credit Default Swaps appear new. On the other hand, some aspects of financial derivatives are very old, perhaps much older than is generally recognized. In this paper, we document that on a practical level, medieval clerics and merchants appear to have had at least an intuitive grasp of “put-call parity”, nearly five centuries before it was described in the scholarly literature.

INTRODUCTION

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Discussions of contract form in this context - clerics and merchants concerned with usury - illustrate a particular case of several much more general phenomena - among them, regulatory arbitrage, and financial innovation. The financial innovation was the development of the triple contract, and its implications for the rise of deposit banking. This instance of regulatory arbitrage will be the focus of this paper.

Current events and the historical record provide several examples of regulatory arbitrage¹. For example, Michael Knoll documents how modern mortgage law was shaped in medieval England by the insight that usury restrictions could be circumvented by suitably structuring loan transactions². This loan structuring is made plain in his exposition by recourse to the logic of Put-Call Parity. Further, Knoll, following Ellickson and Thorland (1995),

¹ The literature on Regulatory Arbitrage is extensive, and will not be reviewed here. Rather, the spirit of this paper is closer to that of Michael Knoll’s work in “The Ancient Roots of Modern Financial Innovation: The Early History of Regulatory Arbitrage”, in the *Oregon Law Review*, v. 87, p. 93-116, 2008. See also, Michael Knoll, “Regulatory Arbitrage Using Put-Call Parity” in the *Journal of Applied Finance*, Spring 2005, v. 15, no.1

²Knoll, “Ancient Roots...”.

documents how usury restrictions were also circumvented in ancient Mesopotamia³.

Put-Call Parity refers to a result published in the academic finance literature by Hans Stoll in 1969⁴. Essentially, $C - P = S - PVK$, where S refers to some specific underlying asset, C and P are European call and put options (respectively) on that asset, with common exercise price K and expiration date T, and PVK refers to the present value of K discounted at the risk free rate out to time T. Options are ubiquitous and occur in many kinds of relationships, and are not always recognized as options. For example, options are very similar to insurance commitments. An auto insurance policy confers the right to exchange your car (after an accident) for a specific payment. The same could be said of a put option on the car, with an exercise price equal to the specific payment.

In this paper, we argue that Medieval clerics and merchants also appear to have had at least an intuitive grasp of put-call parity, and that this insight shaped the Catholic church's approach to medieval business contracts. In the balance of this paper, we will briefly review the scholastic discussion of usury, and some of what is known about standard Western European Medieval business contracts in order to show that put-call parity was understood by the clerics, and probably also by the businessmen by 1515 AD, if not much sooner.

HISTORICAL BACKGROUND ON USURY

Usury doctrine, the prohibition of the taking of interest, was an important part of the Judeo-Christian tradition from antiquity. Indeed, concerns about debt and usury are present in many cultures and long before Abraham, at least to Ancient Mesopotamia, as illustrated by the Code of Hammurabi - roughly 4000 years ago. In some cultures, such as among the ancient Babylonians, the approach was to limit permissible interest rates. At other times, the approach was one or more debt holidays, such as among Hebrews, Greeks and Babylonians⁵. According to Graeber, the concern in many of these contexts was with debt slavery - for communities not far above "subsistence" levels, a crop failure or similar event would force consumption loans that would be difficult to ever pay off, especially with high interest rates. The borrower could be induced to sell off more and more of their assets: land, livestock, even children and wives into slavery to pay off the debt. Eventually, the borrower too could be reduced to slavery.

For others, such as the early Catholic church, and also in Islam, the approach was to prohibit interest entirely. To the Catholic church, money was "barren", and should not produce a profit (without risk). The Catholic view toward usury was based on multiple passages of both

³Michael Knoll, "Put-Call Parity and the Development of the Modern Mortgage (Revised) Working Paper 94-12, USC Law School. See also, Robert C. Ellickson and Charles DiA Thorland, "Ancient Land Law: Mesopotamia, Egypt, Israel, in Chicago-Kent Law Review, V. 71, p. 321-411 (1995).

⁴Hans R. Stoll, "The Relation Between Put and Call Option Prices", Journal of Finance, v. 24, n. 5, p 801-824 (1969)

⁵For an exhaustive and exhausting treatment, see "Debt: The First 5,000 Years", by David Graeber, Melville House Publishing, 2012.

the old and new testaments, as well as Aristotle, but is particularly informed by the Gospel of Luke⁶, and further elaborated in the writings of the Scholastics, but also reflected in popular culture such as in Shakespeare's "Merchant of Venice". On the other hand, Jared Rubin argues that lay Catholic usury restrictions began to be taken more seriously only after the church committed to providing social insurance to the indigent. He argues that provision of social insurance may create a moral hazard, inducing some folks to borrow more. Limiting the interest to zero would discourage such borrowing by reducing lender willingness to lend⁷. A common element to most of these types of restrictions on lending or debt is that the loans typically were used to pay taxes or for consumption purposes, such as after a crop failure. They are not productive loans.

Even so, certain types of business contracts were already in wide use under the Roman Empire even before the Council of Nicea defined the "new" testament. When early medieval clerics including the scholastics sought to explain and defend the prohibition on interest they tended to accept Roman institutions as licit.

As Noonan notes:

"The Scholastics (were) disciples of the Roman Law, and from the earliest revival of Medieval culture, canon law and moral theology are impregnated with the concepts of Roman jurisprudence. The Scholastics (did) not accept this jurisprudence unmodified, but they (did) accept it in substance, and well before the Renaissance regal jurists appealed to it, they established its basic concepts in a realm which concerned practical life most closely."^{8,9}

As disciples of Roman law, the scholastics were more lawyer than economist, and were in fact trained to pay close attention to the form of a contract or other relation, at least as much as to the economic substance of that relation.

ON MEDIEVAL CONTRACTS

Among the Roman contracts considered by the Scholastics were the Sea Loan, and the

⁶Luke 6:35. "Lend freely, hoping nothing thereby". Cited from Noonan, *Scholastic Analysis of Usury*, page 20.

⁷Jared Rubin, "Social Insurance, Commitment, and the Origin of Law: Interest Bans in Early Christianity", *Journal of Law and Economics*, v. 52, November 2009, p. 761-777.

⁸John T. Noonan, "The Scholastic Analysis of Usury", Harvard Univ. Press, 1957, p. 2.

⁹For a sympathetic treatment of the scholastics, see Chapter 9, "Scholastic Economics: Survival and Lasting Influence from the Sixteenth Century to Adam Smith", of "Business, Banking and Economic Thought in Late Medieval and Early Modern Europe: Selected Studies of Raymond de Roover, University of Chicago Press, 1972, edited by Julius Kirshner.

Societas (or partnership). The Roman Sea Loan (Foenus Nauticum), was similar to the Ancient Greek “Maritime loans”, which in turn may have derived from Babylonian sea loans. Sea loans were generally recognized as especially risky due to ship wrecks and piracy among other factors.¹⁰

According to Norman Jones, the Romans allowed an array of interest rates depending on the purpose of the loan. In the Lex Unicaria of 88 B.C., Roman law recognized interest rates of up to 12% for Sea Loans, 8% for business loans, 6% for non-business loans, and 4% for farmers and distinguished persons. In this sense, 12% for a Sea Loan would be, for a Roman, “licit usury”. The extra interest on Sea loans was compensation for risk.¹¹ According to Noonan, the Sea Loan was subject to somewhat more contention. Greek or Roman maritime/sea loans were allowed to charge an explicit yield - for Rome, double the otherwise legal interest rate.¹² For a time, Sea Loans were widely used in Medieval Italy, particularly into the 12th century. Eventually however, the Church under Pope Gregory IX in the decretal “Naviganti” (1234), ruled that Sea Loans were (illicit) usury. During the 13th century, other contract forms may have become more widely used, perhaps because of Naviganti.

The Societas was also a widely used business form in the Roman world:

“The Societas, or Partnership, was a normal form of commercial organization throughout the Roman world; and it enters scholastic thought largely in the form given it by Roman law. A Societas, according to the Digest (of Ulpian) is the union by two or more persons of their money or skill for a common purpose, usually profit....

... Although a partnership in which one partner is entirely freed from risk of his capital in indistinguishable in effect from a loan, the Roman law treats a loan as formally distinct from this contract. The great change in the early Scholastic notion of partnership is that such a riskless partnership will be treated as a usurious loan.”¹³

¹⁰Edward E. Cohen, “Athenian Economy & Society: A Banking Perspective”, Princeton University Press, 1992, p. 161-162. Cohen notes (referring to maritime loans more recently, such as under the Romans): “two criteria are universally insisted upon: (1) a maritime loan must necessarily ... be collateralized by security of ship or sea cargo, free of other encumbrance...; and (2) a maritime loan must necessarily contain a provision freeing the borrower from the obligation of repayment if this security is lost at sea...” Cohen then suggests that in Athens, some loans departed from this standard, with courts accepting whatever arrangements the parties agreed to.

¹¹Norman Jones, “Usury” in Economic History Services of the Economic History Association, February 5, 2010.

¹²Noonan, p. 134-35.

¹³ John T. Noonan, “The Scholastic Analysis of Usury”, p. 133-34.

According to Noonan:

“In this contract, money or goods are loaned to a ship-owner, the creditor assuming the risks of his debtor while the money or goods are actually at sea. If a shipwreck occurs and the property is lost, the debtor will not be liable in any way to return the loan. Once the voyage is completed, however, the borrower trades at his own risk, and if he loses the loan through commercial misfortune, he must still repay the lender. ...
... Roman law, however does not assimilate the case with partnership, but treats it strictly as a kind of licit usury; and the canonists and Scholastics follow the sharp discrimination between it as a loan, and the normal partnership.”¹⁴

The earliest church pronouncements against usury, shortly after the council of Niceae, were directed against clerics. Much later, capitularies of Charlemagne forbade usury generally. At this time, usury and loans were not always clearly defined, and usury was considered an instance of the sin of avarice.

Among the early Scholastics, the *societas* was mentioned in the 11th century by Ivo of Chartres, who distinguished loans, where usury may occur, from lawful partnerships, or *societas*. Following Ivo, the assumption of risk was thought to distinguish investment in a lawful partnership from a illicit loan. Catholic teaching on the topic became more elaborate during the later 11th century.

Noonan ascribes this elaboration to several factors, including the revival of trade at that time. It became apparent that usury on business loans could not so easily be condemned as due to greed or avarice. Instead, clerics such as St. Anselm began to suggest that usury was similar to robbery, and was thus an instance of sin against justice.¹⁵ Concerning this revival of trade, Glaeser and Scheinkman develop a model of interest restrictions and usury laws. They conclude that interest restrictions will become tighter when inequality is high and impermanent. That seems a pretty good description of the conditions in southern Europe as the trade driven “commercial revolution” made some households fabulously wealthy while ruining others.¹⁶

Despite the Carolingian Renaissance, the economy of Western Europe is thought to have contracted for several more centuries after the fall of the Western Roman Empire. Some time around 1000 AD, the level of economic activity apparent bottomed out.¹⁷ During the 11th to 13th centuries, the Mediterranean part of the Western European economy grew, particularly as evidenced by the trade driven prosperity of the Northern Italian city states, such as Amalfi,

¹⁴John T. Noonan, “The Scholastic Analysis of Usury, p. 134-35.

¹⁵Noonan, pages 15-17, 134-142.

¹⁶Edward L. Glaeser and Jose Scheinkman, “Neither a Borrower nor a Lender be: An Economic Analysis of Interest Restrictions and Usury Laws”, *Journal of Law and Economics*, v. 41, (April, 1998), p. 1-36.

¹⁷Robert S. Lopez, “The Commercial Revolution of the Middle Ages, 950-1350, p. 32.

Florence, Genoa, Milan, Pisa and Venice.¹⁸ With this growth came increasing concern on the part of church leaders with usury. It is also worth noting that Church leaders did not always distinguish between business and consumption loans.

Even as the *societas* and sea loans came into increasingly common use, the scholastics struggled to clearly distinguish why *societas*' were acceptable, and sea loans were not. Perhaps the clearest statement is attributed to St. Thomas Aquinas (around 1265):

“He who commits his money to a merchant or craftsman by means of some kind of partnership does not transfer the ownership of his money to him, but it remains his; so that at his risk the merchant trades, or the craftsman works, with it; and therefore he can licitly seek part of the profit thence coming as from his own property.”¹⁹

Even so, scholastics continued to debate the nature of usury, and sought to clarify earlier pronouncements well into the 18th century.

A particular type of partnership, the *commenda* (called *colleganza* in Venice) came into wide use during the 13th century, perhaps in part as a response to concerns about usury.²⁰ On the other hand, rather than being a response to concerns about usury, Yadira Gonzalez de Lara argues that contract choice in Venice was driven by changing institutional conditions, evidently near the end of the 12th century: “Institutional arrangements that enhanced the states’ ability to verify information led the transition from the sea loan (a debt-like contract) to the *commenda* (an equity-like contract).”²¹ While Yadira Gonzalez de Lara does not believe usury played a large role in shaping contract form in Venice, it has been noted that before it became independent, Venice was administratively part of the Eastern Roman Empire, and therefore subject to the Eastern Orthodox church, and so may have found it easier to ignore the Roman Church. Other Italian commercial centers may have been more strongly affected by papal concerns.

Udovitch argues that the *commenda* was essentially similar to an older Islamic business form, the *Qirad*. This contract, by its origins, would also have satisfied concerns about usury.²² According to Pryor, the origins of the *commenda*, that is, the commercial tradition from which it

¹⁸Lopez, pages 71-72.

¹⁹Noonan, p. 143.

²⁰Lopez, p. 76

²¹Yadira Gonzalez de Lara, “Institutions for Contract Enforcement and Risk-Sharing: from Debt to Equity in Late Medieval Venice, working paper, 2006.

²² Abraham L. Udovitch, “At the Origins of the Western *Commenda*: Islam, Israel, Byzantium?”, *Speculum*, v. 37, April 1962, p. 198-207. Udovitch also notes the appearance of the *commenda* in western Europe “in tenth or eleventh century Italy”. On the other hand, Judah Adelson, in “The Early Evolution of Business Organization in France”, *The Business History Review*, v. 31, n. 2 (Summer 1957), p. 226-245. offers arguments that the *commenda* did in fact originate in Roman law, or that it arose from Pre-Islamic trading conventions.

arose, are less clear.²³ However, as a partnership where both parties bore some risk, it met the standard set by the church to avoid the charge of usury.

Whatever its origin, the commenda is said to have facilitated substantial capital investment in trade. One possible consequence - during the late 13th and 14th centuries, Venice may have had the highest per capita income of any city in the world. The commenda is also interesting for our purposes because it may have been a precursor to the “triple contract” which we discuss below.

The commenda came in two main varieties - “unilateral” and “bilateral”. The bilateral form was sometimes also called the “societas maris”. In a unilateral commenda, a funder, called the commendator provides funds for a traveling partner, called a tractor who would take the funds in pursuit of trading opportunity, with more or less direction and advice from the commendator. The commendator would stay home. The tractor would provide their skills and labor. On return, the tractor would give an accounting. If the proceeds exceeded the original commendator’s investment, that would be returned. In addition, the excess would be divided, 3/4 for the commendator, 1/4 for the tractor. If the proceeds fell short of the original investment, the commendator would get the balance, but would have no further claim against the tractor.

Over time, tractors might build up their own funds, and wish to join with a commendator to fund a venture. If the stationary investor (commendator) provided 2/3 of the funds, and the tractor provided 1/3 of the funds, and the venture was profitable, the surplus would be divided evenly. This was called the bilateral commenda. If different ratios of funds were available, merchants could draw up two commendae, one unilateral, and one bilateral, to allocate funds and profits.²⁴ A given tractor would normally represent multiple commendators in a given voyage. According to Yadira Gonzalez de Lara, (citing Lane, 1973), “A typical (ship) cargo probably represented the stakes of something like a hundred investors who had confided sums of various amounts to more than a dozen traveling merchants.”²⁵

While the commenda remained a mainstay of commerce for centuries more, we also see the development of third party maritime insurance during the 14th century, probably originating in or around Genoa.²⁶ Initially, it was not clear how the clerics would respond to insurance. Early examples of the Genoan form of insurance were structured as a “fake sale”. Generally, the insurers were other merchants - specialty insurers had not yet arisen. An insurer merchant would

²³ John H. Pryor, “The Origins of the Commenda Contract”, *Speculum*, v. 52, n. 1, Jan. 1977, p. 5-37.

²⁴ Florence Edler de Roover, “Partnership Accounts in Twelfth Century Genoa”, *Bulletin of the Business Historical Society*, v. 15, n. 6, Dec. 1941, p. 87-92.

²⁵ Yadira Gonzalez de Lara, “Institutions for Contract Enforcement and Risk-Sharing: from Debt to Equity in Late Medieval Venice, a working paper, 2006(?). She cites Frederic C. Lane, in “Venice: A Maritime Republic (1973).

²⁶ Humbert O. Nelli, “The Earliest Insurance Contract - A New Discovery”, *Journal of Risk and Insurance*, v. 39, n. 2, June 1972, p. 215-220. See also Florence Edler de Roover, “Early Examples of Marine Insurance”, *Journal of Economic History*, v. 2, 1945, p. 172-200.

agree to buy the cargo or goods, but not pay or take delivery. The premium might be exchanged “Under the table”. If the cargo got to its destination, the “sale” documents would be set aside. If ship wreck or similar event destroyed the cargo, the “purchase” would be completed. Later, the Florentine form, where there is an explicit premium became the norm, as it remains today.²⁷

Despite the absence of a known Roman prototype, among scholastics, Laurentius de Ridolfis argued in 1403 that insurance was licit, and not usury, because no loan was present. Other clerics joined in, on similar reasoning. Only one minor cleric writing late in the 15th century argued that insurance was usurious.²⁸ However, we will find that once insurance is accepted as “licit”, the distinction between partnerships and loans begins to break down and usury doctrine with it.

Note that both the sea loan and the commenda allow no obligation to repay the investment on the part of the traveling partner in the event of loss at sea. In effect, if we view these as loans, this clause would amount to the commendator giving insurance against loss at sea to the tractor, up to the amount of the commendators claim on the proceeds of the venture. One difference is that with the sea loan, the traveling partner still bears liability for the investment from other types of risk - such as due to adverse price movements. Under the commenda, the insurance, is more general - applying to the whole of the venture.

Late in the 15th century, some scholastics did reconsider insurance in conjunction with other contracts. Recall, St. Aquinas, and most scholastics who followed him had used the incidence of risk to distinguish a usurious loan from a partnership. In 1485, Angelo Carletti, Vicar General of the Franciscans, argued that if you invest in a partnership, but your capital is guaranteed by your partner, and your partner will also pay you an additional sum at his discretion, then this is usury.²⁹ We should note that in this context, the phrase “at his discretion” may have been a bit of a subterfuge. If the contract were generally understood to have required such a payment, that would mark it as usurious. My understanding of this situation is that under the conditions of repeated contracting among a small group of merchants, the “additional sum” would be increasingly, effectively, required.

We can rephrase Carletti’s statement as: If you invest in a partnership, but acquire a put option on its proceeds from your partner/tractator, while you give up a call option to your tractator/partner, you have recreated a loan, which may be usurious. Clearly, Angelo Carletti understood that an equity investment, plus a put, minus call, would approximate a loan, with interest.

Since, by combining a simple partnership or commenda, “capital insurance” and a discretionary sum that will resemble a short call option, this comes close to reconstructing a recourse loan paying an additional sum “x”, Carletti is right. Call it strike one. Then he throws a curve ball. Carletti argues that if you could insure your capital with a third party rather than your partner, you could still licitly profit from the partnership. In so doing, by treating third party

²⁷Van Doosselaere, Quentin, “Commercial Agreements and Social Dynamics in Medieval Genoa”, Chapter 5, p. 170-207, Cambridge University Press, 2009.

²⁸Noonan, p. 202-203

²⁹Noonan, pages 204-205.

insurance as different from insurance by your partner/tractor, he also undermined the longstanding linkage between ownership and the right to a return, and risk of loss.³⁰ In the presence of an active insurance market, merchants could readily insure each other's ventures, becoming the third party insurers. In Genoa, according to Van Doosselaere, that was already happening for maritime insurance.

Perhaps the culmination of contract development during this period is the "Triple Contract". For the 15th century, we see the first possible references to the triple contract. Hunt and Murray report that the triple contract was developed around 1460, and consisted of three parts: A partnership, plus insurance of the principal invested against loss, plus a third insurance like contract, insuring the tractor that the commendator will not ask for more than a given fixed amount. In Germany, another name for these contracts was the "five percent contract."³¹

In the later part of the 15th century, several South German Imperial cities, of which Nuremburg and Augsburg were the most important, took on an increasingly important role in financing silver and copper mining and commerce within the region, and diverse ventures elsewhere. Nuremburg particularly financed local kings princes and nobles, but was reported to have held back from financing Hapsburg loans as too risky. However, after 1474, when the Medici pulled out of Nuremburg, the Fugger of Augsburg began to take on the business of the Roman Curia. From the 14th century, Nuremburg bankers had financed lending by offering investments to "silent partners". The investments were called Komandite, which is a kind of "limited liability company". By contrast "fixed rate deposits", which were widely regarded as usurious, were not used much in Nuremburg.³²

Within a few years, besides the church, the Fugger would also be financing Hapsburg activities. Augsburg came to prominence somewhat later than Nuremburg, but rose rapidly during the later part of the 15th century, driven in part by new developments in Silver and Copper mining, very generous mineral concessions from local rulers, and also the willingness to finance Hapsburg lending. Another distinguishing feature of the Augsburg houses was greater willingness to take on leverage, and to accept "fixed rate deposits".³³

³⁰Noonan, pages 204-205.

³¹Edwin S. Hunt and James Murray, "A History of Business in Medieval Europe, 1200-1550", Cambridge University Press, p. 243.

³² Johann Peter Wurm, Johannes Eck und der Oberdeutsche Zinsstreit 1513-1515, Aschendorff, Munster 1997, pages 41-55.

³³ Wurm, page 53. "Ein besonderes Charakteristikum der augsburger gesellschaften war der verhältnismässig hohe anteil von Fremdkapital im Firmenvermögen. Dabei unterschieden sich die Augsburgern von den Nurnbergern gerade in der für unsere themenstellung entscheidenden Frage nach der Art des Gessellschaftseinlagen. Während die Nurnberger Gessellschaften offensichtlich nach wie vor an der risikobeteiligung des stillen teilhabers in Form der Kommandite festhielten, nahmen die Augsburgern bereits das festverzinsliche Deposit, welches eigentlich wegen seiner Ähnlichkeit mit dem zinsbaren Darlehen kirchenrechtlich unzulässig war Dabei waren die depositen nicht nur rechtlich und moralisch bedenklich, sie

Evidently, a fixed 5% return on the principal per venture was the norm. According to Hunt and Murray, the Triple Contract apparently arose some time around 1460, presumably in Southern Germany, or Northern Italy.³⁴ In 1514 and 1515, the contract was very publicly defended by John Eck, a prominent theologian.³⁵

According to Noonan, Eck saw the triple contract as:

- 1) an ordinary partnership; plus
- 2) a second contract of insurance of the principal, in which insurance is given in return for an assignment of the future probable gain from the partnership; plus
- 3) a third contract by which an uncertain future gain is sold for a lesser certain gain.

waren obendrein noch ausgesprochen gefährlich, da sie oft relativ kurzfristig zurückgezahlt werden mussten und leicht zum Krach einer Gesellschaft führen konnten, die mit zu vielen Fremdmitteln arbeitete.”

I would loosely translate this as: A special feature of Augsburg banking business.. was a relatively high proportion of debt from third parties. The Augsburgers distinguished themselves from the Nurnbergers by the nature of the business position. Whereas the Nurnberger businesses obviously still clung to the risk sharing of the silent partner in the form of Kommandite, the Augsburgers already took the fixed interest deposit, which was actually canonically inadmissible because of its similarity with the tributary loans. These deposits were not only legally and morally questionable, they were on top of everything yet very dangerous, as they often had to be repaid relatively quickly and could easily lead to the crash of a company that worked with many of them.

³⁴ Edwin S. Hunt and James Murray, “A History of Business in Medieval Europe, 1200-1550”, Cambridge University Press, p. 243. In their book, the authors say the triple contract arose around 1460, but with unclear citation. By phone, they are not so sure. We also know that the triple contract was widely discussed in 1514 and 1515, by John Eck. According to Noonan, Angelo Carletti discusses something similar in 1485, but a close reading of Noonan suggests that Carletti he is referring to insured contracts, but not necessarily the triple contract. Nor is not clear whether Carletti was discussing a real or hypothetical contract.

³⁵John Eck achieved fame for defending the licitness of the triple contract in debates with theologians in Italy and Germany. In this, he was actively supported by the banking house of Fugger, who were reported to be among the richest families in Europe, and heavily dependent on funds raised from a form of triple contract that resembles a bank deposit. The Fugger were also actively involved in financing the church and the sale of “indulgences” One of Eck’s allies in this controversy, Sebastian Ilung of Augsburg is reported by Johann Peter Wurm to have said that the triple contract was used almost through-out Christendom (p. 67.) Also according Wurm, Eck himself said that the contract had been in use in Augsburg for more than 40 years. Eck went on to greater fame as the point man in a public debate with Martin Luther, shortly before the latter finally broke with the Catholic church, over issues such as the sale of indulgences. For more on this topic, see “Ulrich Zasius” by Steven Rowan.

We can see, in this formulation of the first two, the same combination that Angelo Carletti saw as usurious. The third element reinforces the loan like quality of the triple contract, as will be seen when we diagram it below. Depending on one's interpretation of these descriptions, the third element can be either a call option, or a straddle or a spread. The first two elements create something between a partnership and a loan with a kink. The third element smooths out the kink (see below) and completes the resemblance to a loan.

For the most part, early insurance records are sparse. However, Quentin Van Doosselaere, a sociologist, acquired and studied a large trove of notarial documents from Genoa for the period 1154 to 1440. Along with sea loans, commenda and some other kinds of contracts, numerous maritime insurance contracts are also recorded. Among his findings are that many of the insurance transactions involve small transactions where merchants insure other merchants, often in a reciprocal way.

He also offers evidence that, despite considerable activity, insurance underwriting was not particularly profitable. Based on his data, some merchants lost money underwriting, and some others barely broke even.³⁶ While discounting diversification as a motive, Van Doosselaere interprets this as a device to create class solidarity among the ruling elite clans of traders, during a period of political strife within Genoa.³⁷

We suspect a different set of motives here. If these insurance contracts were viewed as options, it would make sense that they might not make much money. A long call portfolio would be expected to have high risk and high expected return. A short call portfolio would be expected to lose money. However, it would be a mistake to consider a short call portfolio in isolation. Typically, short calls are combined with a long position in the underlying assets to create a covered call portfolio - a low risk, low, but positive expected return position. Recall too, options trading is a zero sum game. If merchants are reciprocally insuring each other, the expected return may well be close to zero. There is another reason to reciprocate with these insurance policies. The science of insurance underwriting had not yet developed. Merchants could not have been very confident that the insurance/options were priced right. Use of reciprocal insurance relations would allow diversification while also allowing ventures to be modified to suit a merchant's needs, despite possible concerns about usury.

³⁶Van Doosselaere, Quentin, p. 192-193. Pricing data were thin for Genoa in his data. Specifically considering maritime insurance for voyages originating from Ragusa and also from Spain to America, He states: "Thus, considering the transactions costs of each contract, it appears that in these two circumstances the maritime insurance business as a whole was at best a break-even, and more likely a losing enterprise. ...samples of individual biographies give further credit to this theory."

³⁷Van Doosselaere, Quentin, p. 194. "...the viability and growth of this key business innovation was indeed sustained not by its profitability for the underwriters, but by its social role in building ties between elite clans. In doing so, the insurance business became a locus of consolidation of social boundaries, further protecting the interests of the wealthy mercantile oligarchy."

If we view the triple contract in terms of options rather than insurance, from the perspective of the commendator, it would appear as a partnership, plus a long put option, plus a short call option. There is some ambiguity about the implied strike price, since the put strike may have been the initial investment, or somewhat above that, and the call strike is possibly 5% above the initial investment. As long as these two strike prices were the same, the corresponding equation would be:

$$S + P - C = ?$$

This fits easily into put call parity, which is:

$$S + P - C = PVK.$$

That is, the triple contract would effectively be a loan, with interest. If the strike prices differ, the triple contract is not quite a loan, but it is close. Note, that nothing about the triple contract requires the interest rate to be 5%. In that sense, the German “5% contract” is a special case of the triple contract.

It may be useful to consider modern option pricing payoff diagrams to illustrate this: First consider a simple recourse loan. Under such a loan, the commendator pays I, and the tractor contributes his labor. The payoff S goes to the tractor, subject to the need to payback the loan. Let I be the amount invested, S be the value of the resulting venture, x is any additional payment to the commendator at the conclusion of the venture. Then:

Recourse Loan (see Table 1, and Figure 1, below.)

	Commendator	Tractor
At time 1 (at the start)	pays I	receives I
Tractor invests I to get S		
At time 2 (distribute proceeds)	receives I+x	receives S, pays I+x (net= S-(I+x))

The payoff diagram plotting receipts against S would be a flat line for the commendator, corresponding to the loan. The tractor receives a diagonal line passing into positive space where $S = I+x$. Of course, a recourse loan would have the problem that the tractor, or his estate, would have to pay even if the venture failed or even if he did not survive. According to Gonzalez de Lara, such loans were normally collateralized. Otherwise, given the extreme sanctions applied to bankruptcy during this period, that could be problematic.

Next, let's consider a non-recourse loan. For such a loan, the lender promises - insures - that they will make no claim beyond the proceeds of the venture. Under such a loan, the inputs are the same, but the commendator will receive the loan payment ($=I+x$), minus a put option with strike price (I+x). The above insurance amounts to giving the put option to the tractor/borrower. The tractor will receive the put on the venture, plus the venture minus the loan ($=S - (I+x) + Put$). Note that the commendators payoff could also be represented as a long position in the venture with a short call - a covered call. That is, $Loan - Put = Venture - Call$. Likewise, the tractor's position could be represented as a long call with strike price (I+x). That is, $S - (I+x) + Put = Call$. These are both ways to express put-call parity:

Non-Recourse Loan (see Table 1, and Figure 2, below.)

	Commendator	Tractor
At time 1 (at the start)	pays I	receives I
Tractor invests I to get S		
At time 2 (distribute proceeds)		
(If $S > I+x$)	receives $I+x$	receives S, pays $I+x$
(If $S < I+x$)	receives S	receives S, pays S (net=0)

For a non-recourse loan, the payoff to the commendator would look like a loan minus a put, or a covered call on the venture - rising diagonally until $S = I+x$, at which point it becomes a flat line. Unless motivated by Christian charity, the commendator would expect a substantial x to compensate for having retained the downside risk but not the upside potential, as illustrate in table 1 (below). The tractor's payoff would be the corresponding long call on the venture (or a long put on the loan), rising diagonally from where $S=I+x$. The tractor would have less risk and less return than with a recourse loan, but would still face a risky payoff.

Now consider the partnership. Under a simple partnership such as a *societas*, the commendator pays I, the tractor adds his labor. If we assume for purposes of comparison that the same ratio applies here as to a commenda, then at maturity, 3/4 of S goes to the commendator, and 1/4 of S goes to the tractor. Of course, this is not ideal - a tractor could go away and promptly return to collect 1/4 S. The commenda solves that problem. Under the commenda, the commendator receives repayment plus 3/4 of the surplus beyond repayment of the initial investment.

Simple Partnership (see table 1, and figure 3, below.)

	Commendator	Tractor
At time 1 (at the start)	pays I	receives I
Tractor invests I to get S		
At time 2 (distribute proceeds)		
(If $S > I$)	receives $3/4*S$	receives $1/4*S$
(If $S < I$)	receives $3/4*S$	receives $1/4*S$

For a simple partnership, the payoff diagram to the commedator is a diagonal line with slope $3/4*S$. The tractor gets a payoff of slope $1/4*S$. There is less risk here for the tractor than a loan, but the return is less as well. As noted above, there is a potential agency problem.

Now consider a partnership with insurance of the principal. The insurer might be a third party, or the tractor. If the latter, this would address the agency problem above. With insurance, the payoff to the commendator would be I if $3/4*S < I$, and would be $3/4*S$ if $3/4*S > I$.

Partnership with Insurance of Principal. (See table 2, and figure 4, below.)

	Commendator	Tractor	Insurer
At time 1 (at the start)	Pays I	receives I	-0-
Tractor invests I to get S			
At time 2 (distribute proceeds)			
(If $3/4*S > I$)	receives $3/4*S$ minus premium	receives $1/4*S$	receives premium
(If $3/4*S < I$)	Receives I	receives $1/4*S$	makes up shortfall

Partnerships with principal insurance produce a kink in the payoffs. The commendator's payoff is kinked downward where $I=S$. The tractor's payoff, assuming they are also the insurer, is kinked upward (see below).

Triple Contract (partnership with principal insurance less uncertain gain plus sure smaller gain) (see table 2, and figure 5, below.)

	Commendator	Tractor	Insurer
At time 1 (at the start)	Pays I	Receives I	-0-
Tractor invests I to get S			
At time 2 (distribute proceeds)			
(If $3/4*S > I$)	receives $3/4*S$ minus premium less uncertain gain plus smaller sure gain (x) = $I+x$	receives $1/4*S$	receives premium plus uncert. gain less sure gain (x)
(If $3/4*S < I$)	Receives $I+x$	receives $1/4*S$	makes up Shortfall $S-I$, Pays out x

Recall, the triple contract consists of a partnership + insurance of principal - uncertain gain + smaller sure gain. It was presented as a partnership with insurance. In fact, to the commendator, the two insurance parts, like the two options they resemble, convert the whole to what is effectively a recourse loan. To the tractor, it remains a partnership, unless they take up the other side of the two insurance parts.

Now consider a commenda. With a commenda, the initial investment is repaid first, and then the excess is divided, $3/4$ to the commendator, and $1/4$ to the tractor. For the commendator, the payoff diagram is a diagonal line until $S=I+x$, at which point the slope shifts down to $3/4$. In terms of the payoff diagram, the difference between a simple partnership and a commenda is a trapezoid like shape similar to the payoff from a bull call spread. The commendator receives $1/4*S$ up to $(I+x) + 1/4*(I+x)*(S-(I+x))$ more than under the simple partnership. Put differently, up to $S=I+x$, the commenda looks like a non-recourse loan. Beyond $S=I+x$, the commenda looks like a partnership. The tractor has less risk, and less return.

Commenda (see table 1, and figure 6, below.)

At time 1 (at the start)	Commendator	Tractor
Tractor invests I to get S	pays I	receives I
At time 2 (distribute proceeds)		
(If $S > I$)	receives I + $3/4*(S-I)$	receives $1/4*(S-I)$
(If $S < I$)	receives S	receives $S-S$ (net=0)

Now suppose we add investment “insurance” to the commenda. The insurance underwriter sells a put on the venture to the commendator, with strike price (I), in exchange for some of the potential gain (S-I). The latter is a call option. The commendator now has a protective put on the venture, similar to a recourse loan, paying I, but also with some upside potential. That is, when the commendator sells a call and buys a put, he has reconstructed something that begins to look like a recourse loan. So who would buy such a call? In Genoa, during the 13th century, there was an active market in third part insurance. Merchants could use this market to insure their ventures, to diversify, and to partially transform commenda into 5% loans.

Commenda with insurance of principal. (See table 3, and figure 7, below.)

At time 1 (at the start)	Commendator	Tractor	Insurer
Tractor invests I to get S	pays I	receives I	-0-
At time 2 (distribute proceeds)			
(If $S > I$)	receives I + $3/4*(S-I)$ less premium	receives $1/4*(S-I)$	receives Premium
(If $S < I$)	receives I	receives $S-S$ (net=0)	makes up Shortfall (S-I)

Addition of insurance to the commenda reverses the kink for the commendator. If the tractor is also the insurer, their payoff begins to resemble that of a recourse loan again.

Finally, we can also add an exchange of an uncertain gain for a smaller sure gain. If the tractor takes the opposite side of that too, we have again constructed the triple contract, and closely mimicked a loan.

Triple Contract (commenda + insurance of principal - uncertain gain + smaller sure gain.)
(See table 3, and figure 8, below.)

At time 1 (at the start)	Commendator	Tractor	Insurer
Tractor invests I to get S	Pays I	Receives I	-0-
At time 2 (distribute proceeds)			
(If $3/4*S > I$)	receives $3/4*S$ minus premium less uncertain gain plus smaller sure gain (x)	receives $1/4*S$	receives premium plus uncert. gain less sure gain (x)

	= I+x	tractor+insurer gets S-(I+x).
(If $3/4 * S < I$)	Receives I+x	receives $1/4 * S$ makes up Shortfall S-I, Pays out x

As can be seen on figures 5 or 8, the triple contract essentially reconstructs the cashflows associated with a recourse loan. As such, if there is interest, one might conclude there is usury. Because scholastics had already accepted partnerships, including the commenda, as well as insurance in connection with these partnerships, they could not conclude that without reversing themselves on prior decisions. As was alluded to before, in 1515, in a major defense of the triple contract by Johannes Eck, Eck concluded that the triple contract was licit.³⁸

Neither the occasion for the debate nor Johannes Eck's participation in it were purely academic. To some extent, the controversy may have been prompted by the death in 1509 of Melchior von Mechau, the Cardinal of Brixen, and subsequent litigation over his estate.³⁹ Eck's participation in the controversy was prompted by Dr. Conrad Peutinger, town clerk of Augsburg, and chief publicist for the large trading firms there, including the Fugger. Peutinger urged Eck to defend the threefold (triple) contract against charges that it was usurious. According to Rowan, "Much of the capital of the major Augsburg firms derived from deposit contracts paying a fixed annual interest rate, usually five percent".⁴⁰ In fact, Eck's activity was substantially financed by Fugger banking interests.

The death of the cardinal of Brixen, Melchior von Mechau in 1509 revealed a substantial investment in the Fugger bank, variously described as a "silent partnership"⁴¹ and a deposit.⁴² There followed protracted litigation between the church in Rome, the Fuggers and various third parties over the disposition of the estate. Had the timing been slightly different, and the had Fuggers been compelled to immediately turn over the proceeds, the claim might have bankrupted

³⁸ Noonan, p. 208-212.

³⁹ Lawrence G. Duggan, "Melchior von Mechau: A Missing Link in the Eck ZinsDisputes" *Archiv fur Reformationsgeschichte.*, v. 74 (1983), p. 25-37.

⁴⁰ Rowan, p. 111. It is not clear here whether these were deposits or "5% contracts".

⁴¹ Johann Peter Wurm, "Johannes Eck und der Oberdeutsche Zinstreit 1513-1515" *Aschendorff Munster*, 1997. On page 54, Wurm writes: "Auch die Fugger bekamen die risiken des depositen geschäfts jah zu spuren, als am 3 marz 1509, ihr grosster, wenn auch nur stiller Teilhaber, der Kardinal und Bischof von Brixen Melchior von Meckau plotzlich verstarb und die Romische Kurie wenig spater des Mechausche Erbe bei der Fugger Bank einforderte." In this sentence, "stiller teilhaber" translates as "silent partner". This sentence can be translated as: The Fuggers were also, given the risks of the deposit business, put on notice... when on 3 march 1509, their greatest - even though only a silent partner, the Cardinal and Bishop of Brixen Melchior Meckau suddenly died and the Roman ... Curia, not long thereafter, called in the Mechausche heritage from the Fugger Bank.

⁴² Rowan, p. 111.

the Fugger bank. The Fugger interest was to play for time, which they did while raising funds elsewhere. Thereafter, several prominent Upper German academic and clerical commentators “launched an attack on fixed interest contracts and large scale cartels... By the start of the second decade of the (16th) century, attacks on the financing methods of large firms were being launched with telling effect at Imperial diets, and legislation was being formulated to limit the amount of capital which could be held by business concerns operating in the Empire.”⁴³

Johannes Eck’s response to Peutingner’s urgings included three essays in 1514 and 1515, “Treatise on Usurious Contracts”, “The Counsel of Johannes Eck on the Five Percent Contract”, and the “Treatise on the Five Percent Contract”. These analyses supported a publicity campaign, “fronted by Eck, backed by Peutingner’s letters, and floated on Fugger monetary, logistical and political support”.⁴⁴

Two generations later, in 1560, the Jesuits took up the fight again, arguing that the triple contract was indeed usury. Debate continued for decades, until finally in 1581, the general congregation of Jesuits, meeting in Rome, concluded that while taking 5% interest on a loan was usury, the triple contract yielding 5% was not.⁴⁵ By this time, the protestant reformation had greatly reduced the significance of the Catholic church’s position. Any merchant or prince unhappy with such conclusions would just have one more reason to switch sides.

In the theological discussions it is clear that from Angelo Carletti on, the scholastics understood that the triple contract recreated a loan. They evidently understood put-call parity. Had an equivalent loan been considered, it surely would have been ruled illicit. In the form of the triple contract, the scholastics were in a box. So, they accepted the contract while rejecting its equivalent.⁴⁶ As for businessmen, by this time, the House of Fugger, and other Augsburg banking houses were routinely financing loans to princes by taking “5% contracts” from money centers such as Antwerp and Augsburg. It made perfect sense for the Fugger to finance Eck if his arguments would allow them to claim that instead of taking illicit deposits, they were making licit triple contracts.

Put-Call Parity, the modern understanding that an equity investment plus a put option, minus a call option with the same expiration and strike price is effectively a loan, was understood by clerics and financial market participants nearly 500 hundred years before Hans Stoll described it. Hence, Some parts of financial derivatives, and financial engineering are not so new after all.

⁴³Rowan, p. 111.

⁴⁴Rowan, p. 112.

⁴⁵Noonan, p. 212-217.

⁴⁶For a fun Blog on the subject, see <http://magic-maths-money.blogspot.com/2011/07/structured-finance-in-twelfth-century>, “Structured Finance in the Twelfth Century”, by Tim Johnson.

Table 1. Illustration of some Basic Medieval Contracts

Recourse Loan			Return:5%								
Outcome	1	2	3	4	5	6	7	8	9	10	Avg.
Venture	0	40	80	120	160	200	240	280	320	360	180
Commendator	105	105	105	105	105	105	105	105	105	105	105
Tractor-105	-65	-25	15	55	95	135	175	215	255	75	
Non Recourse Loan			Return:35								
Venture	0	40	80	120	160	200	240	280	320	360	180
Commendator	0	40	80	120	135	135	135	135	135	135	105
Tractor0	0	0	0	25	65	105	145	185	225	75	
Simple Partnership											
Venture	0	40	80	120	160	200	240	280	320	360	180
Commendator	0	30	60	90	120	150	180	210	240	270	135
Tractor0	10	20	30	40	50	60	70	80	90	45	
Commenda											
Venture	0	40	80	120	160	200	240	280	320	360	180
Commendator	0	40	80	115	145	175	205	235	265	295	155.5
Tractor0	0	0	5	15	25	35	45	55	65	24.5	

Here we illustrate some basic Medieval contracts. For simplicity, following Commenda terminology, the provider of funds to be invested is called the Commendator. The merchant who will use those funds in trade is called the Tractor. In all cases, we assume 100 units of funds are provided, and consider a venture that can produce a range of outcomes, from abject failure (proceeds=0), to substantial profit (proceeds=360).

A recourse loan, assuming good collateral, allows the Commendator a safe 105 units for a 5% return. A non-recourse loan, such as a Sea Loan, might occur when the Tractor has no other assets exposes the Commendator to substantial risk of loss. To achieve the same average 105, he'd have to charge 35% over the life of the venture. Sea Loans were ruled Usurious in the 13th century.

A partnership is another form. Following the convention with Commenda, we assume the Commendator will claim 3/4 of any proceeds, leaving 1/4 to the Tractor. Note that the Tractor gains even if the venture is a disappointment. The Tractor has much less incentive to take risks than the Commendator. A Commenda addresses this, so that the Tractor gets nothing until the Commendator is fully compensated for their investment.

Table 2. Illustration of a Partnership modified by Insurance

Simple Partnership + Insurance of Principal											
Outcome	1	2	3	4	5	6	7	8	9	10	Avg.
Venture	0	40	80	120	160	200	240	280	320	360	180
Commendator	100	100	100	100	112.3	130.7	149.1	167.5	186.0	204.4	135.0
Tractor0	10	20	30	40	50	60	70	80	90	45	
Insurer	-100	-70	-40	-10	7.7	19.3	30.9	42.5	54.0	65.6	0.0
Tractor-100	-60	-20	20	47.7	69.3	90.9	112.5	134.0	155.6	45.0	
+Insurer											
							Sure Gain:		5		
Uncert. Gain	0	0	0	0	12.3	30.7	49.1	67.5	86.0	104.4	35.0
Sure Gain	5	5	5	5	5	5	5	5	5	5	5
Triple Contract (Simple Partnership + Insurance of Principal - Uncertain Gain + Sure Gain)											
Commendator	105	105	105	105	105	105	105	105	105	105	105
Tractor0	10	20	30	40	50	60	70	80	90	45	
Insurer -100	-70	-40	-10	7.7	19.3	30.88	42.5	54.0	65.6	0.0	
Tractor-100	-60	-20	20	47.7	69.3	90.88	112.5	134.0	155.6	45.0	
+Insurer											
Tractor/ Combined	-105	-65	-25	15	55	95	135	175	215	255	75

In table 2 we illustrate some basic Medieval contracts as modified by Insurance ideas. As with table 1, the provider of funds to be invested is called the Commendator. The merchant who will use those funds in trade is called the Tractor. In all cases, we assume 100 units of funds are provided, and consider a venture that can produce a range of outcomes, from abject failure (proceeds=0), to substantial profit (proceeds=360).

Table 2 shows a partnership modified by insurance of the principal. Various interpretations are possible, but my understanding is that this insurance was not paid by a specific premium before the fact, but instead was paid with a pre-determined fraction of the proceeds, paid after the fact. The result is that only successful outcomes pay the insurance. Given the probabilities of the various outcomes, that fraction can be quite high. We do know that early insurance was not very profitable, so I solved for the fraction that caused the insurance cash flows to break even. For these numbers, that fraction is 38.6%. Note that all cash flows occur at the same time, so there is no need to discount them. The next two lines capture the 3rd part of the triple contract as described by Johannes Eck, “sale of an uncertain gain for a lesser certain gain”. Note that when these are combined with a simple partnership and insurance of the principal, we have reproduced the cash flows of the recourse loan. In this sense, the Triple contract is a formally a partnership, but effectively a loan.

Table 3.

Commenda + Insurance of Principal											Premium	0.245
Outcome	1	2	3	4	5	6	7	8	9	10	Avg.	
Venture	0	40	80	120	160	200	240	280	320	360	180	
Commendator	100	100	100	111.3	134.0	156.6	179.3	201.9	224.6	247.2	155.5	
Tractor0	0	0	5	15	25	35	45	55	65	24.5		
Insurer	-100	-60	-20	3.7	11.0	18.4	25.7	33.1	40.4	47.8	0.0	
											Sure Gain	5
Uncert. Gain	0	0	0	11.3	34.0	56.6	79.3	101.9	124.6	147.2	55.5	
Sure Gain	5	5	5	5	5	5	5	5	5	5	5	
Triple Contract (Commenda + Insurance of Principal - Uncertain Gain + Sure Gain)												
Venture	0	40	80	120	160	200	240	280	320	360	180	
Commendator	105	105	105	105	105	105	105	105	105	105	105	
Tractor0	0	0	5	15	25	35	45	55	65	24.5		
Tractor-100	-60	-20	8.7	26.0	43.4	60.7	78.1	95.4	112.8	24.5		
+Insurer												
Tractor/ Combined	-105	-65	-25	15	55	95	135	175	215	255	75	

In table 3 we illustrate how the Commenda is modified by Insurance ideas. As with table 1 and 2, the provider of funds to be invested is called the Commendator. The merchant who will use those funds in trade is called the Tractor. In all cases, we assume 100 units of funds are provided, and consider a venture that can produce a range of outcomes, from abject failure (proceeds=0), to substantial profit (proceeds=360).

Table 3 shows a Commenda modified by insurance of the principal. Various interpretations are possible, but my understanding is that this insurance was not paid by a specific premium before the fact, but instead was paid with a pre-determined fraction of the proceeds, paid after the fact. The result is that only successful outcomes pay the insurance. Given the probabilities of the various outcomes, that fraction can be quite high. We do know that early insurance was not very profitable, so I solved for the fraction that caused the insurance cash flows to break even. Note that all cash flows occur at the same time, so there is no need to discount them. For these numbers, that fraction is 24.5%. The next two lines capture the 3rd part of the triple contract as described by Johannes Eck, "sale of an uncertain gain for a lesser certain gain". Note that when combined with a commenda and insurance if the principal, we have reproduced the cash flows of the recourse loan. In this sense, the Triple contract may formally be a Commenda, but effectively a loan. Initially, I was under the impression that the Triple contract evolved from the Commenda, but as we saw with table 2, that need not have been the case - the triple contract could also have evolved from the ordinary partnership.

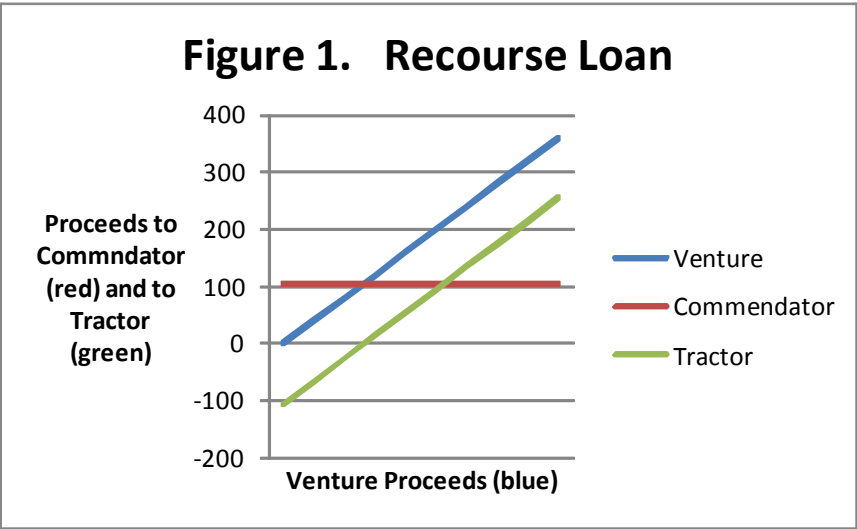


Figure 1. Recourse Loan

Figure 1 plots the data for the recourse loan in table 1. At time 1 (at the start) the commendator pays I, the tractor receives I. During the venture the tractor invests I to get S. At time 2 (to distribute proceeds) the commendator receives I+x, and the tractor receives S, pays I+x (net= S-(I+x)). The payoff diagram plotting receipts against S would be the flat (red) line for the commendator, corresponding to the loan. The tractor receives the diagonal (green) line, passing into positive space where S = I+x. Clearly, a recourse loan is quite risky for the Tractor.

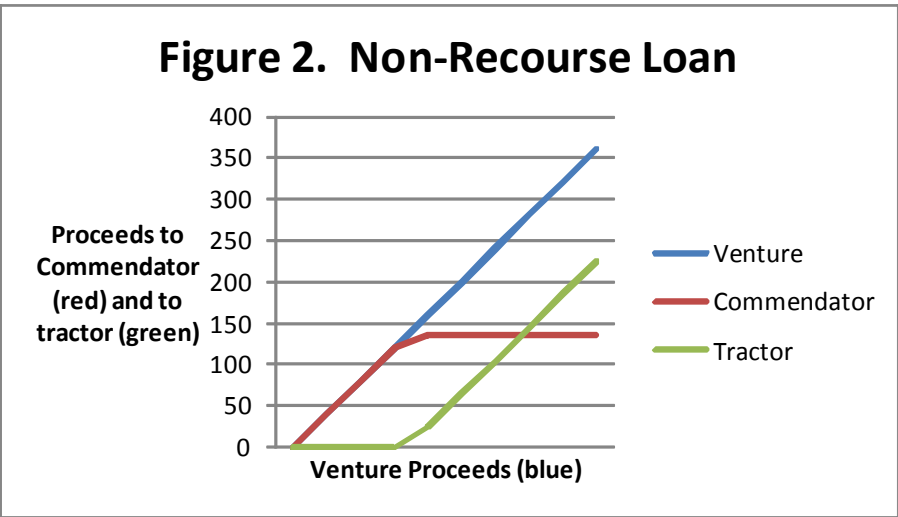


Figure 2. Non-Recourse Loan.

Figure 2 plots the data in table 1 for the non-recourse loan. At time 1 (at the start) the commendator pays I , tractor receives I . During the venture, the tractor invests I to get S . At time 2 (to distribute proceeds): If $S > I+x$, the commendator receives $I+x$, and the tractor receives S , pays $I+x$, If $S < I+x$, the commendator receives S , and the tractor receives S and pays S (net=0). The payoff diagram plotting receipts against S would be the diagonal (blue) line up to $S=X+I$, and the flat (red) line for the commendator, corresponding to the loan. The tractor receives the diagonal (green) line passing into positive space where $S = I+x$. Here the risk of a recourse loan to the Tractor is reduced, but to compensate the Commendator for the lower cashflows in poor states, the return in good states must be higher.

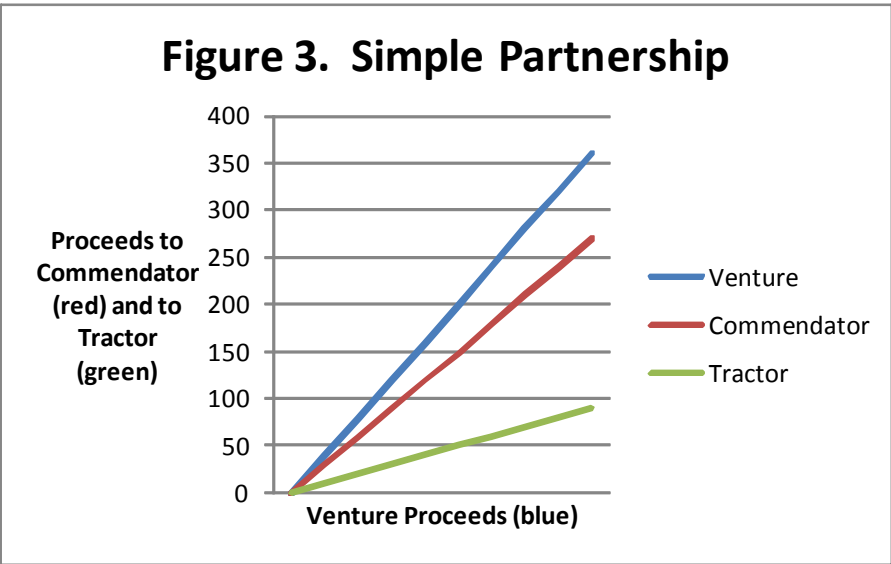


Figure 3. Simple Partnership

Figure 1 plots the data for the simple partnership in table 1. At time 1 (at the start) the commendator pays I, the tractor receives I. During the venture the tractor invests I to get S. At time 2 (to distribute proceeds): If $S > I+x$, the commendator receives $3/4*S$ and the tractor receives $1/4*S$, If $S < I+x$, the commendator receives $3/4*S$ and the tractor receives $1/4*S$. The payoff diagram plotting receipts against S would be the steep diagonal (red) line for the commendator, and the flatter diagonal (green) line for the tractor.

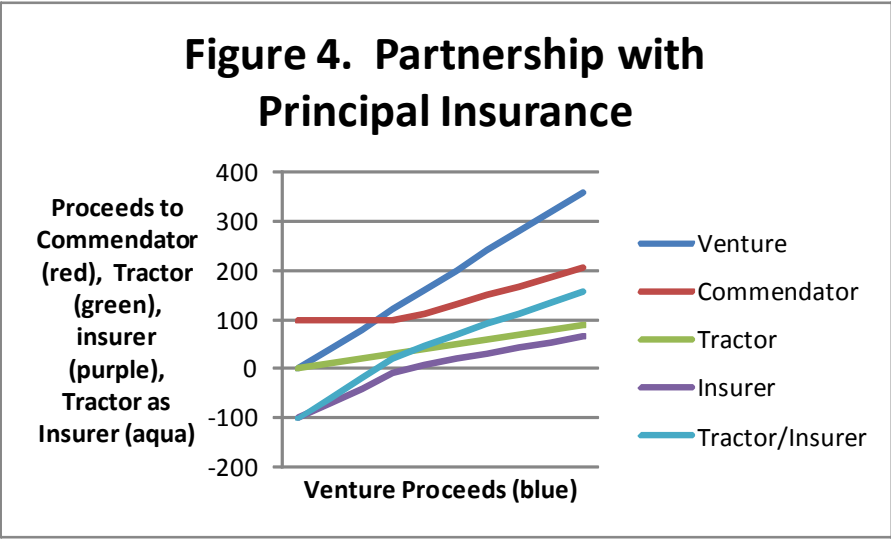


Figure 4. Partnership with Principal Insurance

Figure 4 plots data for the partnership with principal insurance from table 2. At time 1 (at the start) the commendator pays I and the tractor receives I . The insurer agrees to insure the principal in exchange for a portion of the profit if the venture is successful. During the venture, the tractor invests I to get S . At time 2 (to distribute proceeds), (If $3/4 * S > I$) the commendator receives $3/4 * S$ less the premium, and the tractor receives $1/4 * S$. The insurer receives the premium. If $3/4 * S < I$, the commendator receives I , the tractor receives $1/4 * S$, and the insurer makes up the shortfall to the commendator.

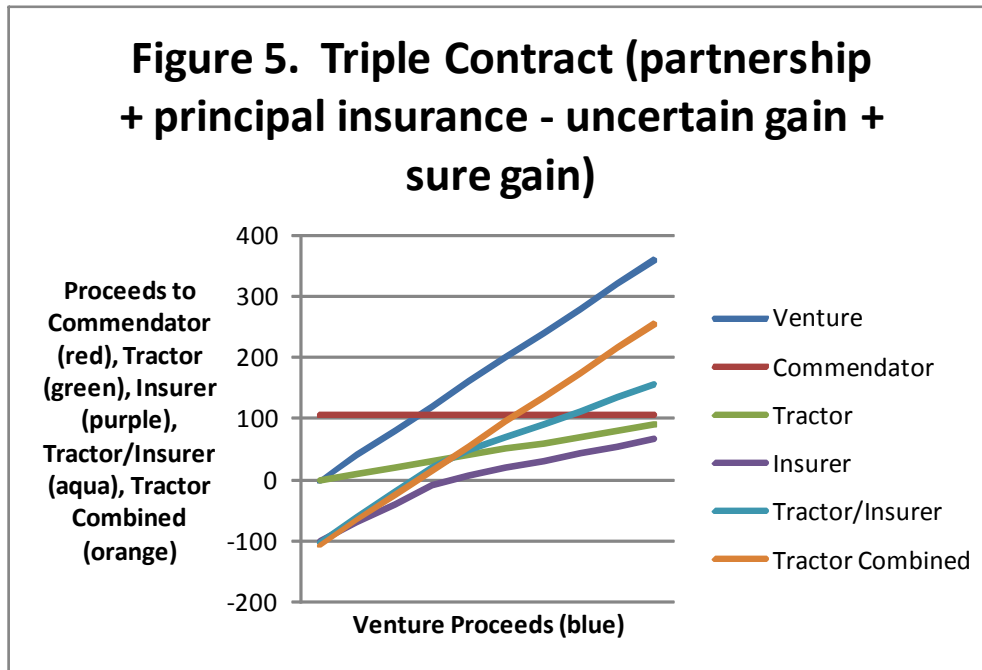


Figure 5. Triple Contract (partnership with principal insurance less uncertain gain plus sure smaller gain)

Figure 5 uses the data for the triple contract from table 2. At time 1 (at the start) the commendator pays I , the tractor receives I . The insurer agrees to insure the principal in exchange for a portion of the profit if the venture is successful, and also to accept the uncertain gain in exchange for the smaller sure gain. The tractor invests I to get S . At time 2 (to distribute proceeds) If $3/4 * S > I$, the commendator receives $3/4 * S$ minus the insurance premium, less the uncertain gain, plus the smaller sure gain, which boils down to $I+x$. The tractor receives $1/4 * S$. The insurer receives insurance premium, plus the uncertain gain, less the smaller sure gain. If the tractor chooses to also be the insurer, the tractor/insurer combined receives $S-(I+x)$.

The important result here is that the Commendator receives the same payoff as would occur with a recourse loan. The Tractor receives a partnership like payoff, unless they choose to be the counter party for the principal insurance, and the exchange of the uncertain gain for the sure gain. If they do, their position amounts to that of a recourse loan.

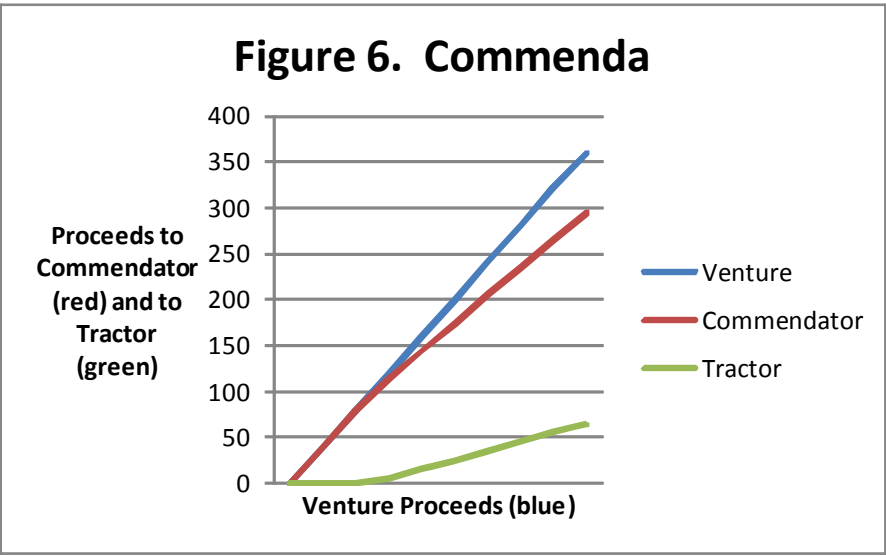


Figure 6. Commenda

Figure 6 uses the Commenda data from table 1. At time 1 (at the start) the Commendator pays I and the Tractor receives I , who then invests I to get S . At time 2 (to distribute proceeds) If $S > I+x$, the commendator receives $I+x + 3/4*(S-(I+x))$, and the tractor receives $1/4*(S-(I+x))$. If $S < I+x$, the commendator receives S , and the tractor receives $S-S$ (net=0).

Figure 4 plots the data for the Commenda from table 1. At time 1 (at the start) the commendator pays I and the tractor receives I . During the venture, the tractor invests I to get S . At time 2 (to distribute proceeds): If $S > I+x$, the commendator receives $I+x + 3/4*(S-(I+x))$, and the tractor receives $1/4*(S-(I+x))$. If $S < I+x$, the commendator receives S and the tractor receives $S-S$ (net=0). The payoff diagram plotting receipts against S would be the kinked diagonal (red) line for the commendator. The tractor receives the diagonal (green) line passing into positive space where $S = I+x$.

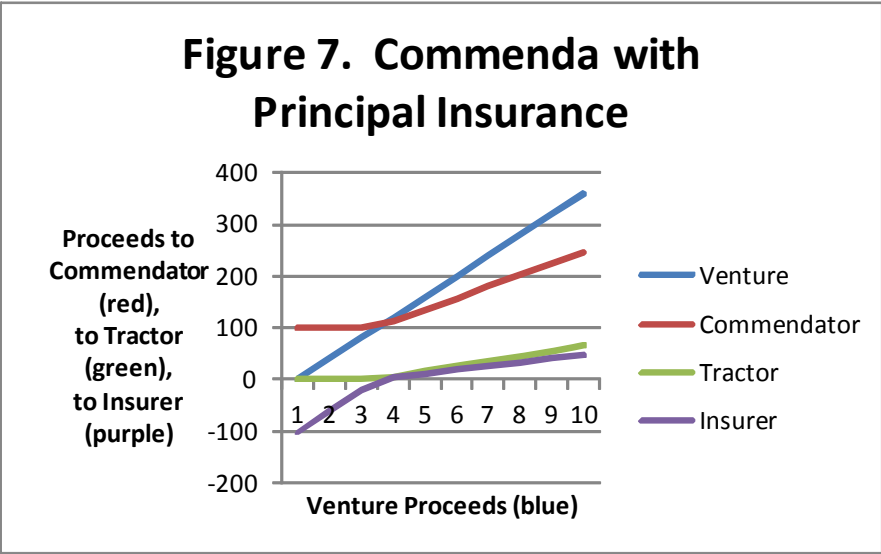


Figure 7. Commenda with Insurance of Principal.

Figure 7 uses the data from table 3. At time 1 (at the start) the commendator pays I , and agrees to forgo some of the profit beyond $(I+x)$. The tractor+insurer receives I and insures (I) , and then invests I to get S . At time 2 (to distribute proceeds), If $S > I+x$, the commendator receives $I+x + 3/4*(S-(I+x))$, the tractor receives $1/4*(S-(I+x))$. If $S < I+x$, the commendator receives I , the tractor receives $S-S$ (net=0), and the insurer pays the shortfall.

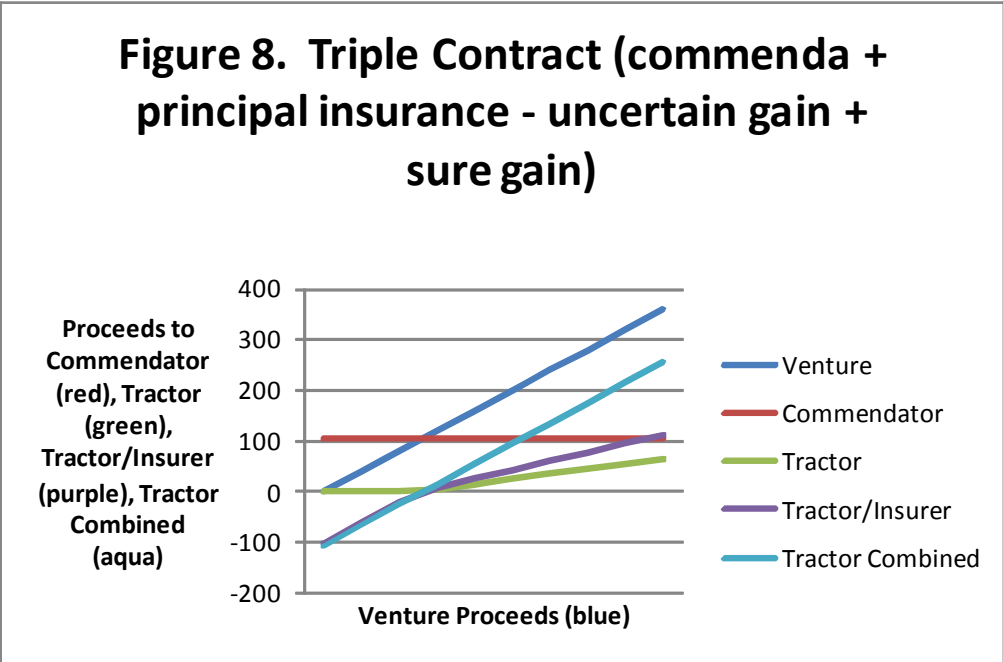


Figure 8.

Triple Contract (commenda with principal insurance less uncertain gain plus sure smaller gain)
 Figure 8 uses the data from table 3. Combining a commenda with principal insurance and an exchange of an uncertain gain for a smaller sure gain results in reproducing the recourse loan.

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