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Practitioner's Abstract: *Academia and the finance industry generate many proposals for new contract markets. Unfortunately, many proposed markets lack the critical attributes that promote success. We examine these attributes, and evaluate the potential of several announced proposals. We find that proposals emanating from the academy generally fail to consider the full suite of integrated financial services necessary to support a viable market, while proposals put forward by practitioners are much more likely to do so.*

Keywords: market viability, futures, options

I. Introduction

At any given moment, there are numerous proposals for new contract markets. Indeed, the financial world has an impressive history of innovation in contract markets, with many notable successes. The most conspicuous evidence on such performance is available from organized futures exchanges. The number of active futures markets has increased dramatically in the last quarter century. As a rough guide, Table 1 presents the number of futures markets with price quotations in the first issues of the *Wall Street Journal* in 1979 and 2004, by category (commodity, equity index, etc.). The total number has increased over this time frame from 40 to 83. The most actively traded futures markets today include interest rate, energy, and stock index markets, most of which were established in the past quarter century. Looking beyond futures markets, recent innovation has been intense in exchange-traded options and over-the-counter (OTC) derivative trading.

The history of contract market innovation is replete with failures, however. Silber (1981) finds that less than one third of new futures contracts introduced between 1960 and 1977 achieved an annual trading volume greater than 10,000 contracts three years after introduction. Pennings and Leuthold (1999) report that by Silber's criteria, fifty-eight percent of exchange-traded commodity contracts introduced between 1994 and 1998 failed. Some recently listed futures contracts that have attracted relatively little trading interest include: numerous cross exchange rate futures at the Chicago Mercantile Exchange (CME), temperature degree-day futures at the CME, and narrow stock market index (e.g. Dow Jones Transportation Index) futures at both the CME and the Chicago Board of Trade (CBOT).

Suggestions for new contract markets are generally put forward by academic economists with an interest in a particular area, industry participants seeking hedging opportunities, or by derivative exchanges or dealers interested in increasing order flow and revenue. These proponents typically cite a possible hedging demand and a lack of similar instruments as reasons why a particular proposal is likely to achieve success. Unfortunately, only casual attention is given to the literature on contract market viability. This literature has identified numerous factors other than hedging demand and contract novelty that impact a contract design's eventual success.

The purpose of this paper is to assess the potential viability of recently proposed contract markets using concrete criteria, reflecting the lessons learned regarding market viability over the last century. Before presenting our assessments, we define the criteria for determining contract success, and identify the critical conditions required to achieve liquidity.

Proposal put forth in the last several years include residential real estate price index derivative, economic derivatives, livelihood insurance, commodity-linked developing world debt, FOMC options, single-stock binary options, information aggregation mechanisms (IAM) markets, event ticket markets, various weather contracts, and credit derivatives. We assess the first four of these proposals.

II. Criteria for Contract Market Success

Our focus is on derivative contracts, not spot transactions. Hull (2000) declares that “a *derivative* (or *derivative security*) is a financial instrument whose value depends on the values of other, more basic underlying variables.” The variety of derivatives includes standard futures, forwards, spreads, the dizzying array of options, swaps, and strips, among others.¹

Many authors take the pragmatic approach of defining market success as the achievement of sustained, significant levels of trading activity. This activity is typically measured by the trading volume and open interest statistics reported by regulated futures exchanges. As mentioned above, Silber (1981) regards a successful futures contract as one with an annual trading volume of 10,000 contracts three years after listing. Sandor (1973) uses the more relaxed criterion of 1,000 contracts traded annually. Carlton (1984) and Black (1986) simplify the definition (and observation) of success for futures contracts further still – implementing the “*Wall Street Journal* test” whereby listing in that *Journal* is the criterion. This requires a daily trading volume of 1,000 contracts and an open interest of 5,000 contracts, a much more stringent criterion than either Silber’s or Sandor’s. Note that all of these criteria define success essentially from the point of view of the organized futures exchange, as trading activity is a proxy for exchange revenue, which is in turn a component of exchange members’ utility. In the case of OTC markets operated by a single entity (e.g., the Intercontinental Exchange), a trading activity criterion for market success is instead a proxy for the organizing entity’s revenue and utility. In the case of a decentralized principal-to-principal OTC market (e.g., the interbank foreign exchange market), a trading activity criterion for market success is not particularly relevant.

An alternative is to judge the success of a contract market from society’s point of view rather than the exchange’s. Working (1953, 1970) notes three primary economic

¹ Williams (2001), however, takes issue with describing many futures contracts as derivatives of their corresponding spot prices. He notes the common practice of spot trading in physical commodities at price differentials to a futures contract, making the case for regarding futures prices as primitive rather derivative. He states that “physicals markets ... do not exist independently of the derivative markets. This fact exposes that ‘derivatives’ is not the most informative term.” We do not engage either side of this debate, but instead sidestep the issue by simply referring to markets for any of the instruments mentioned above as “contract markets.”

functions of commodity futures markets, each of which promotes an increase in society's welfare. First, futures markets are useful to handlers of a commodity, providing means of hedging inventories and forward marketing. Second, futures markets provide publicly observable prices for a commodity that are established in an open, competitive environment. In the absence of a futures market and such publicly observable prices, smaller firms in an industry can be at an informational disadvantage with regards to current market conditions. The third function is the facilitation of intertemporal allocation of a commodity. A futures market allows a merchant to purchase a commodity in the spot market, and simultaneously arrange for its sale in the future at a known price (in the case of a storable commodity). This tends to attenuate the price depressing effects of a current excess supply, spreading the consumption of the commodity out over a period of time. Likewise, in the event of a current excess demand for a commodity, the ability to purchase for future delivery at a lower price encourages a shift in intertemporal consumption to more closely match the expected arrival of additional supplies. Producers also receive price signals from futures prices (Just and Rausser, 1983). A high (low) price for delivery of a commodity at a date in the future encourages increased (decreased) production.

Telser reinforces and extends Working's analysis. In a series of papers (Telser & Higinbotham 1977, Telser 1981, Telser 1986), he argues that the primary functions of futures markets are the reduction of transactions costs and the facilitation of trade among strangers. This latter function is accomplished via the institution of the clearinghouse. In short, the clearinghouse is a surrogate counterparty in all trades. Two traders, upon discovering complimentary position requirements, each take the offsetting desired positions with the clearinghouse. This arrangement relieves the two traders of the need to assess one another's creditworthiness, with each instead trusting only in the creditworthiness of the clearinghouse. Thus the existence of a futures market allows transacting at reduced cost relative to spot or forward trade in a commodity, with futures in effect serving a role analogous to money. Continuing the analogy, Telser notes that futures markets facilitate long and short hedging, in the same way that the existence of currency facilitates the borrowing and lending of credit. This in turn facilitates intertemporal allocation of the commodity, thus smoothing its consumption, a potentially significant benefit to society. Telser further asserts that this benefit is due to the very existence of the futures market, regardless of the level of open commitments (Telser 1986, p. S20). Essentially, the Working-Telser criterion that any futures market that attracts sufficient trading activity to sustain its own existence can be deemed a success. The existence of such success tends to provide benefits to society. To be sure, these benefits include facilitation of hedging, reduction of transaction costs, price discovery, and intertemporal allocation of supplies of a physical commodity. The combination of these last two benefits provide the foundation for a reliable forward price curve.

To some extent, Working-Telser concepts are codified into U.S. law. Title 7, Chapter 1, Section 5 of the US Code gives the findings and purpose of the Commodity Exchange Act (as modified by the Commodity Futures Modernization Act of 2000). The Act states that:

The transactions subject to this Act are entered into regularly in interstate and international commerce and are affected with a national public interest

by providing a means for managing and assuming price risks, discovering prices, or disseminating pricing information through trading in liquid, fair and financially secure trading facilities.

The Commodity Futures Trading Commission (CFTC) interprets the meaning of the Commodity Exchange Act with respect to the economic and public interest requirements for contract market designation in Title 17, Chapter 1, Appendix A to Part 5 of the Code of Federal Regulations (a.k.a. “Guideline No. 1”). They specify three primary rules: 1) contracts must not be designed so as to be conducive to price manipulation or distortion, 2) any cash settled contracts should be based on a “cash price series that is reliable, acceptable, publicly available and timely”, and 3) contracts must be expected to be used for hedging and/or price basing on a more than an occasional basis.² U.S. law and regulation thus designate the hedging and price discovery functions of contract markets as important, but make no specific mention of the intertemporal allocation and transaction cost reduction roles that Working and Telser describe for futures markets.

The existing literature on contract market viability focuses almost exclusively on futures markets. We, however, consider diverse varieties of proposed contract markets – futures, forward, and options (both exchange-traded and over-the-counter). Accordingly, we also assess the benefits provided by non-futures contract markets, and how the criteria for evaluating the success of such markets might differ.

Certainly the hedging function is central to any proposed contract market, regardless of variety. Price discovery can be considered an important benefit of any market whose prices are publicly disseminated. In the context of an option market, the price discovery function can be re-interpreted as a probability discovery function, where observed prices reveal the market consensus probabilities of possible future states of the world (Breedon & Litzenberger, 1978). Price discovery thus remains an important role for any of the contract markets that will be considered. However, option markets play no direct role in the intertemporal allocation of supplies of a physical commodity.³ Also, over-the-counter contract markets generally do not provide the benefit of allowing trade among strangers at reduced cost, as there is typically no clearinghouse in such markets.

The criterion we use in the following analysis of suggested contract markets is similar to that Telser suggested for futures markets: if a market is likely to attract sufficient trading activity to constitute a viable ongoing concern, then it provides the foundation for generating benefits to society.

Recent advances in technology are expected to continue to evolve and may well influence contract viability. Several organized derivative exchanges outside the U.S. now exclusively trade electronically: the London International Financial Futures Exchange and

² Guideline No. 1 is based on the Commodity Exchange Act before it was modified by the Commodity Futures Modernization Act of 2000. There has been no re-interpretation.

³ However, the arbitrage relationships that exist between futures and associated futures options markets imply that the latter can have an indirect role in intertemporal supply allocation. Specifically, the put-call parity relationship is such that particular combinations of futures options positions constitute a “synthetic futures” position. See Hull (2000) for details.

Eurex being two noteworthy examples. U.S. exchanges are increasing their activity in this realm as well; witness the available overnight electronic trading in many markets, simultaneous electronic and open-outcry trading in interest-rate contracts at the Chicago Board of Trade, and exclusive electronic trading of some contracts (e.g. the “e-mini” S&P 500 index futures contract at the Chicago Mercantile Exchange). Motivating this trend is the calculation that the infrastructure required to support an automated trade-matching system is significantly less expensive to maintain than that required to support a traditional double-auction (i.e. open outcry) system. If an exchange already has electronic trading and clearing facilities in place, the marginal cost of listing additional contracts for electronic trade is likely to be fairly low. This implies that contracts that would have been considered failures (from an exchange’s point of view) in the past may be available for trade in the future. In the over-the-counter realm, technological advances are likely to reduce dealers’ cost of negotiating contracts, and thus similarly effect the range of viable contracts that would otherwise exist.

III. Key Characteristics of Successful Contracts

In this section, we consider the five basic conditions necessary for the existence of a viable contract market. These conditions are 1) the existence of a precisely defined underlying value, 2) the provision of mechanisms that ensure contract enforceability and acceptable counterparty risk, 3) the provision of market making services, 4) the existence of markets for laying off risk, 5) the existence of an impetus for trade, and 6) the attraction of hedging activity. The first three conditions constitute a suite of integrated financial services that the organizing entity must provide before trading can begin in earnest, while the last three conditions are necessary for a market to thrive once trading has commenced.

The first basic condition necessary for a viable contract market is the existence of a precisely defined underlying value. There must exist an active trade in an asset that will be deliverable against the prospective contract, or whose price will serve as the basis for cash settlement of the contract. Alternatively, a contract that specifies cash settlement may be based on an available price index or the realization of an observable random variable. If no such trade, price index, or random variable exists, trading cannot commence. This may seem obvious, but as we will see the establishment of some proposed markets are contingent upon the creation and acceptance of a suitable price index. As a result, this condition may well separate the more concrete proposals that might be easily implemented from those proposals whose implementation is remote. An asset or price index that will underlie the proposed contract must be widely accepted by the industry as a standard, reliable value benchmark.

The second basic condition necessary for a viable organized contract market is an acceptable counterparty risk profile. Before making a trade participants must have a reasonable expectation that their counterparty will perform under the terms of the contract. Provisions for managing counterparty risk are observed in existing successful contract markets. Williams (2001) notes that several institutional features of futures and futures option markets relieve participants from concern that their counterparties will default. First, the official clearinghouse is introduced as a surrogate counterparty in every

transaction – every buyer's seller and every seller's buyer. This novation allows market participants to focus only on the creditworthiness of the clearinghouse. The clearinghouse in turn ensures its own solvency by requiring its counterparties (those with positions in the market) to deposit and maintain funds in a margin account that guarantees contract performance. Furthermore, the margin account is generally debited (credited) for each day's decrease (increase) in the market value of the trader's portfolio. This helps to prevent the growth of large unprofitable positions on which a trader might default. Substantial incidences of default in over-the-counter contract markets may even motivate the development of markets with such protection mechanisms. Indeed, Telser (1977, 1981) sees the trade among strangers that is facilitated by these protection mechanisms as the primary motivation for the existence of futures markets. By contrast, forward contract markets do not incorporate such protection mechanisms, and thus do not facilitate trade among strangers at low transaction cost.

The third basic condition necessary for the existence of a viable contract market is the provision of market making services. In all contract markets, there can be no reasonable expectation that the order flow generated by hedgers will be precisely balanced, i.e. that an order to buy will always arrive in the market at the same time that an order to sell. Furthermore, traders must be assured that once they take a position, it will be possible to exit that position at a “fair” price. These issues give rise to the need for short-term liquidity provision in the market. There are two mechanisms by which market making might happen. First, a market might have an official market maker who is required to simultaneously quote both sides of the market at all times. This is the case, for example, in markets such as those that were operated by the now defunct Enron Online. Attracting such traders is only possible in markets that have a significant, consistent order flow, however, as these traders typically make a very small average profit on a very large number of transactions. In the absence of an official market maker, such services must be provided by independent, short-term speculators.

The fourth basic necessary condition, viz. the availability of markets for laying off risk, is closely related to the provision of market making services. If there is to be no officially designated market maker, then a new market must attract voluntary market makers. The availability of correlated markets provides a means by which market makers can lay off risk (short of unwinding their positions), which is particularly important in the case of a new, illiquid contract. Additionally, organized large-scale speculation is very often motivated by expectations over changes in one price relative to another rather than simply outright price changes. For example, a trader might believe that market conditions are such that in coming months electricity is going to become more valuable *relative* to the natural gas that is used to produce that electricity, without having any particular expectations regarding the *absolute* changes of either price. This trader might then take an appropriate “spark spread” position – long in an electricity forward market and short in a natural gas forward market. The existence of economically related markets is required before such inter-market spreading can occur.

The fifth basic necessary condition for is the existence of an impetus for trade. There must exist a significant degree of price uncertainty, as it motivates the activity of both hedgers and speculators, and its absence would obviate the market's necessity (Telser

1981, Carlton 1984). Horrigan (1987) cites the significant decrease in inflation uncertainty in the 1980s as a primary reason for the poor performance of the Consumer Price Index (CPI) futures contract that was briefly traded at the Coffee, Sugar & Cocoa Exchange (now a part of the New York Board of Trade). Note that we are careful to distinguish between variability and uncertainty. A price or other quantity underlying a contract may be highly variable, but if this variation is perfectly predictable a contract is unlikely to thrive. In addition to outright price uncertainty, variability in the relative levels of intertemporal prices contributes to an impetus for trade.

The sixth basic necessary condition is the attraction of hedging activity – a condition seems to be more thoroughly considered than others in most market proposals. Unlike the first five conditions, which were relatively straightforward, there are several factors that promote substantial hedging activity in a market: a large pool of potential hedgers, heterogeneous hedger goals, a favorable environment with regard to existing contracts, a good contract design, and freedom from market manipulation.

A large, diverse underlying trade or risk pool is an important factor promoting hedging activity. There are two components to this condition. First, a large value of transactions in an underlying market implies that there is a greater potential overall benefit, in the form of risk reduction, which will be made possible by the existence of a contract market (Carlton 1984). Second, an industry with low concentration and a minimal degree of vertical integration implies the existence of a large number of potential hedgers and encourages the development of contract markets (Carlton 1984, Black 1986). Additionally, a large, diverse underlying trade tends to reduce the potential for market manipulation. Alternatively, a proposed contract might be based simply on a non-tradable random variable. In such a case the analog to a large underlying trade is widespread economic risk associated with that variable. Weather conditions are examples of such variables.

Heterogeneous goals are important. A market cannot appeal exclusively to long or short hedgers. Speculators or market makers can absorb unbalanced hedger desires to some extent, but a bias is likely to result if one type of hedger is underrepresented (Gray 1960), and such markets typically have very low trading volume. This need for heterogeneous goals is closely akin to the Figlewski (1978, 1982) perspective that speculators have heterogeneous expectations regarding future prices. He notes that if all traders have the same expectation regarding the future price of a contract, the market price will quickly converge to this common expected value removing all motivation for trade.

Relation to existing contracts is also a critical determinant for new contract viability. The conventional wisdom is that new contracts that allow for hedging of previously unhedgable risks will be popular, as the theoretical models of Duffie & Jackson (1989) and Cuny (1993) suggest. Carlton (1983) provides empirical evidence that the Chicago Board of Trade's rye futures contract failed because it was largely redundant, given the other available grain futures markets. As a practical matter, exchanges may very well offer new contracts closely related to existing contracts (e.g. those of the soybean and crude oil complexes). Williams (2001) points out that such complexes of related markets represent specific economic activities: bean crushing, oil cracking, grain milling, barge

transportation, etc. Offering a menu of correlated contracts provides the ability to hedge such transformation activities, and thus a new market being highly correlated with an existing market will not necessarily result in low hedging use. The recent development of several successful “e-mini” contracts provides additional counter evidence refuting the argument that low correlation with existing markets is a necessary condition for market success. E-mini markets are essentially perfectly correlated with their full size counterpart contracts, but provide relief from the contract “lumpiness” problem. In short, some markets are complementary to one another – all highly correlated markets are not competing substitutes as the conventional wisdom suggests. In any case, however, a new market must offer some unique characteristics that are useful to traders if it is to thrive.

Contract design is important for all contracts. For physically settled contracts, it is important that the delivery provisions correspond to dominant industry practice (Gray 1965 ; Williams 2001). This includes factors such as lot size, delivery locations, delivery timing, grade of the asset, and the price differentials associated with deviations from the standardized terms. Poor design can result in a contract that favors either buyers or sellers, at the expense of significant participation on the part the opposite side. In the case of cash-settled contracts, the choice of the underlying value is important. It must be chosen in such a way that hedgers do not face an excessive amount of basis risk. Several examples of markets that failed due to poor contract design are documented in the literature. Johnston & McConnell (1989) attribute the failure of the Chicago Board of Trade's Government National Mortgage Association collateralized depository receipt futures market to the availability of a competing contract with a design that more closely matched hedgers' needs. Thompson, Garcia & Wildman (1996) attribute the failure of the Minneapolis Grain Exchange's high-fructose corn syrup contract in part to poor delivery specifications. Powers (1967) reports that seemingly minor alterations to the specifications of the Chicago Mercantile Exchange's frozen pork belly contract had a significant impact on the level of trading activity. Horrigan (1987) cites a lack of correspondence between the CPI and potential hedgers' actual consumption bundles as a factor that contributed to the failure of the CPI futures contract.

Prevention of manipulation is a consideration closely related to contract design. Futures contract specifications must not be such that a single party or group is likely to control a significant portion of deliverable supplies (Gray 1966). Such a condition would facilitate an artificial increase in the futures price in the event that the party that controls the deliverable supplies also stood for delivery on a significant long futures position. The occurrence or perceived possibility of such market “corners” or “squeezes” would understandably engender reservation on the part of potential market participants, and would prove detrimental to a fledgling market's success. A common strategy for preventing corners and squeezes is to allow delivery of nonstandard grades of an underlying asset at a premium or discount to the futures price, although this can result in the futures price reflecting one of the nonstandard grades that shorts deem to be cheapest to deliver. Carlton (1984) also observes that successful contracts are based on commodities whose prices are not heavily influenced by government-sponsored manipulation (e.g. price support programs in agricultural markets), as such policy is often specifically devised to attenuate price variability, which in turn reduces the need for

hedging. A contract might also suffer if government provides competing risk-management services (e.g. crop insurance programs).

IV. Analyses of Current Contract Proposals

Real Estate Price Index Derivatives

Case, Shiller & Weiss (CSW, 1993) propose the establishment of futures and options contracts that would be cash-settled on the basis of residential real estate price indices.⁴ They suggest that the geographic scope of the underlying price indices should be, at most, regions of the US (e.g., the Northeast), but that price indices covering individual cities would be preferable. They present compelling arguments supporting this idea. Real estate comprises the majority of national wealth, spread across a very large number of owners. Hence exposure to real estate price risk is pervasive. Residential real estate price uncertainty in particular is a significant source of risk to individual wealth, as almost all individuals have either significant long or (implicit) short positions in this market. It thus seems as though vehicles that provided convenient means of efficiently reallocating this risk would provide significant benefits to society. Almost no vehicles exist for hedging this type of risk. It thus seems as though the landscape of the existing contracts and hedging vehicles is favorable with regard to the potential for the proposed contracts to attract hedging activity.

There are many potential hedgers who might use residential real estate price index derivatives. Homeowners and landlords are obviously at risk, as direct owners of residential real estate. Others face less obvious risks associated with price declines. Mortgage lenders face default risk in the event of an economic downturn. Home builders face the risk that homes prices will fall between the times that construction decisions and sales are made. Municipalities face the risk of decreasing property tax revenues in the event of falling home prices. Prospective homeowners and renters are potential sources of long hedging interest. The average actual or potential homeowner has no experience hedging using derivatives markets, however. CSW suggest that this obstacle might be overcome by repackaging the derivatives into familiar-looking insurance products. Shiller & Weiss (1999) expand on this theme.⁵ While individuals are generally endowed with a surfeit of residential real estate price risk, institutional investors currently have no practical means of gaining exposure to this market. Residential real estate thus represents a heretofore untapped asset class that institutional investors could use to diversify their portfolios, increasing their efficiency as they say in portfolio parlance.

The futures and options contracts proposed by CSW would be exchange-traded, and as such would be introduced with accompanying clearinghouse guarantees for traders. This mitigates any concerns over counterparty risk. Given the significant transaction costs associated with real estate transactions, it would seem that the price indices that might underlie the proposed contracts would be difficult to manipulate.

⁴ They suggest contracts based on commercial and agricultural land as well, but residential real estate price index contracts have received the most subsequent attention.

⁵ The experience of Caplin, et al. (2003) suggests that this may be a difficult undertaking.

The CSW proposal satisfies many of the conditions for contract success. There are, however, other conditions that are likely to be only marginally satisfied. The exchange-traded nature of the proposed contracts implies there would be no officially designated market maker that is required to provide liquidity, but it would instead be provided by short-run speculative traders. A necessary condition for attracting such trading is a reasonable degree of short-run uncertainty regarding underlying price indices. In the case of a city-wide (or wider) real estate price index, however, short-run fluctuations are likely to be very small relative to overall value, suggesting that these markets might have a difficult time attracting liquidity-providing scalpers. If this is in fact the case, there is little that could be done to overcome this obstacle.

While short-run real-estate price uncertainty is likely to be minimal, the long-run price uncertainty that is more relevant to many potential hedgers seems to be more significant. This, combined with the substantial financial leverage that is generally employed in real estate purchases, would seem to imply a significant motivation for hedging activity. Unfortunately, as discussed in CSW, hedging long-run price risk using the short-term contracts would be difficult at best, and only the short-term contracts have a reasonable potential to attract voluntary liquidity providers.

There are some conditions for contract market success that the CSW proposal will have a very difficult time overcoming. The novelty of the contracts proposed by CSW potentially limits their attractiveness to large-scale speculators. Such traders would have few avenues through which they might lay-off risk associated sizable positions, and spread trading opportunities would be limited.

The contracts envisioned by CSW would need to be based on freely-reported price indices that are widely accepted as standard, reliable value benchmarks. No such indices exist at this time. Certainly, there are extensive proprietary price indices that are used by industry, perhaps most notably the “REdex” repeat sales price indices maintained by the Case Shiller Wise branch of Fimat. As these are not freely-reported, however, they cannot effectively serve as a basis for trading. Given this state of affairs, the CSW proposal fails to satisfy one of the necessary conditions for contract viability. This lack of a basis for trading represents a significant, but not insurmountable, hurdle that must be overcome before trading could commence in the proposed contracts.

The choice of underlying price indices represents a significant contract design challenge. The tradeoff between potential liquidity and basis risk for potential hedgers that is inherent to contract design is especially pronounced in the case of the CSW proposition. Regional price indices would seem to represent the smallest feasible geographic scope that could attract sufficient liquidity to the proposed contracts, but unfortunately such indices would expose hedgers to a high degree of price risk. Basis risk concerns motivated Caplin, et al. (2003) to select zip-code level price indices to underlie price index-based home price insurance contracts.

One possible avenue for overcoming this obstacle is the “pass-through” insurance imagined in CSW and Shiller and Weiss (1999). Derivative contracts might be based on regional price indices, and writers of the pass-through insurance could then absorb the

remaining basis risk and write policies on smaller geographic regions such as zip code. This would be similar to, say, the natural gas market, where there is a symbiosis between the OTC and exchange-traded derivatives markets. The OTC derivatives dealers write contracts custom tailored for their clients, and lay off a portion of the risk using the exchange traded contracts. As a result, both markets thrive – each benefiting from the existence of the other. A regional geographic scope for the exchange-traded contracts would still allow the derivatives to serve the needs of institutional long hedgers (lenders exposed to residential mortgage default risk) and institutional investors.

Overall, however, there are serious obstacles to the successful establishment of exchange-traded real estate price index contracts, and such establishment cannot be considered likely in the short to medium term. A current effort afoot in California is attempting to refute this analysis. Advanced e-Financial Technologies, Inc. endeavors to establish futures and options markets based on zip-code level real-estate price indexes. Initially, AeFT plans to offer futures on three to five zip codes in Corona, Pasadena and Santa Monica, California (Freidman 2003).

Economic Derivatives

Recently, financial services firms Goldman Sachs and Deutsche Bank and inter-dealer broker ICAP have initiated trading in “economic derivatives” contracts – cash-settled over-the-counter options whose payoffs are determined by various economic statistics. Underlyings include U.S. Non-Farm Payrolls, U.S. Initial Jobless Claims, the ISM Manufacturing Purchasing Managers’ Index (PMI), U.S. Retail Sales (excluding autos), and the Euro-zone Harmonized Index of Consumer Prices (HICP; excluding tobacco). These markets are operated as “parimutuel derivative call auctions” (PDCAs), an innovative new market structure that renders several of the conditions for market success that we describe to be easily fulfilled.

The PDCA market structure, developed by Longitude, Inc., is distinguished from conventional derivatives markets by two features. First, trading is not continuous, but rather carried out during a limited number (one or two) of short-lived (one to two hour) auctions prior to the release of the underlying economic statistic. Second, buy orders for specific contracts are not necessarily matched with sell orders for identical contracts. Instead, the final auction prices for *all* contracts with same underlying are determined in such a way that the payoffs for all filled orders will exactly exhaust the premiums collected, regardless of the level of the underlying at the contracts’ expiration (hence the appearance of “parimutuel” in PDCA). Essentially, in a PDCA the entire pool of positions based on a single source of uncertainty constitute a zero-sum game, unlike traditional one-to-one trade matching where each individual trade is a zero-sum game. This “many-to-many matching” is accomplished by traders placing limit orders for positions in the various contracts during the auction’s bidding period, and each of these potential positions implies a particular replicating portfolio in underlying Arrow-Debreu state-contingent securities. At the conclusion of the auction’s bidding period, collected

premium-maximizing prices (given the limit order book) are selected for the state-contingent securities, subject to the parimutuel constraint (Longitude, 2003).⁶

The parimutuel market structure ensures that traders need not concern themselves with counterparty risk, as all payouts will be funded by collected premiums. The condition that market making services be provided must be reinterpreted to mean simply that there must be a party willing to operate the PDCA many-to-many matching system. Given that there is no need for a conventional market maker (or makers) who might accumulate an unbalanced book, there also need not exist correlated markets for laying off risk. Given that orders need only be matched with a complimentary (from a payoff perspective) pool of orders for possible quite different contracts, the condition that a large, diverse underlying trade exist is greatly relaxed. Liquidity is pooled across all traders with an interest in the same underlying risk, rather than being pooled only across traders with interests in each particular contract. While this latter condition is greatly relaxed, there must obviously be at least some exposure in the economy to a particular underlying risk.

The particulars of each market employing the PDCA structure will determine whether or not the other conditions for contract market success are satisfied. Each of the new markets listed above obviously satisfies the conditions that a basis for trading exist, the contracts are certainly novel (i.e., have a favorable relation to existing contracts), and underlying economic statistics are unlikely to be manipulated. There is without doubt uncertainty regarding these statistics, providing an impetus for trade to those whose fortunes are affected by statistical releases, mostly large portfolio managers. These various managers' portfolios are undoubtedly situated on either "side" of a particular release (e.g., some portfolios will benefit from an increase in Non-farm Payrolls, other will suffer), so that potential hedgers have heterogeneous goals.

If there is one weak aspect to the presently considered markets, it is that substantial basis risk is likely to exist for most potential hedgers. For example, it is obvious that releases of the macroeconomic statistics that underlie these contracts can have significant impacts on debt and equity portfolios, but it is often difficult to predict the direction and magnitude of these of impacts.

Livelihood Insurance Contracts

Shiller (2003) proposes livelihood insurance contracts based on labor income indices. Although the proposed contracts are described as insurance, they are not designed to protect against a sudden, substantial loss or expense that a person or entity might experience. They are instead meant to be useful for hedging labor income uncertainty

⁶ This system bears some resemblance to the system by which futures contracts are traded on the Tokyo Grain Exchange (TGE), especially in that both systems feature tatonnement auctions that minimize the potential for the short-run liquidity mismatches that can plague continuous double auction markets. At the TGE, however, a single market-clearing price is found each day for each individual contract (i.e., a single futures delivery), whereas in a PDCA notional value-maximizing prices are found for all contracts (that are based on a single underlying source of uncertainty) simultaneously. Also, the payoffs to the contracts established on TGE are not collectively self-financed as the PDCA contracts are; TGE futures markets feature the performance bond requirements and daily marking-to-market that characterize most other exchange-traded derivative contracts.

that unfolds gradually over time, and thus share a common characteristic with typical derivative contracts.⁷

Shiller argues that the potential for changes in the compensation that can be earned in an individual's chosen profession represents one of the largest risks that most people face. Livelihood insurance contracts would allow individuals to hedge this risk, allowing young people to choose potentially risky career paths knowing that they would be assured some minimal level of income. No mechanisms currently exist for hedging this type of risk, a favorable factor for attracting the hedging activity necessary for contract success.

The indices that would underlie the proposed contracts would each be based on repeated observations of the income levels of fully employed individuals who had undertaken similar career training. These individuals would be considered to be in the same occupation and would continue to influence the appropriate income index, regardless of their current line of work. This construction distinguishes these indices from other existing labor indices in that they would reflect the true economic fortunes of people who choose similar training, rather than reflecting the incomes of people who remain in a given profession. This distinction would be very important in the case of a profession that experienced a significant decline in the numbers of individuals employed. The remaining individuals could possibly enjoy income levels similar to those before the decline, while those that were forced to find alternative employment found their incomes significantly reduced. In this situation, conventional indices like those published by the Bureau of Labor Statistics would be little changed, while the indices proposed by Shiller would reflect the overall decline in the profession. Thus the latter indices would be much more effective for managing the risk associated with career choice, reducing the basis risk faced by policy holders. Minimal basis risk is one component of the good contract design that would be necessary to attract hedgers to the new contracts. Similar labor income indices are described in Shiller (1993) and constructed in Shiller and Schneider (1993).

Shiller suggests that basic contracts might work as follow. Policy holders would be paid, on an ongoing basis, a percentage of the "decline in the income of the average person who has started working in the field (and who continues to work, though not necessarily in the same field, or has gone back to school for retraining) below a specified lower level for the income." Basing payments on the index rather than on individual income avoids a moral hazard problem, as each individual's effort could have only an insignificant impact on the index level. Premiums might be paid as a percentage of future income, or as a single up-front sum. The latter alternative would result in a policy that closely resembled a "floor" derivative contract, while the former alternative would result in a policy that somewhat resembled a swap. The single up-front premium (the floor-like policy) would prevent a gradual adverse selection problem whereby policy holders cancel their coverage in the event that their profession thrives, potentially leaving the insurance company in the position of collecting too little in premiums to cover the payouts to the policy holders in less successful professions.

⁷ Shiller (1993) and Shiller and Schneider (1993) propose labor income index futures and options contracts. They provide very little detail on how such contracts might be designed however, and the present suggestion for livelihood insurance contracts seems to supercede this earlier proposal.

There are some conditions for contract market success that this proposal only marginally fulfills. The uncertainty inherent in the compensation received in many professions will only be minimal. The hypothetical doctoral student imagined by Shiller who was considering a career in recombinant DNA technology undoubtedly would face substantial uncertainty regarding future income given the uncertainty surrounding the future commercial value of that technology. However professions such as electrician, school teacher, and taxi driver involve significantly less uncertainty and people contemplating entering these professions would be unlikely to purchase livelihood insurance. The pool of likely policy purchasers seems limited to those people entering professions with high income risk that require extensive, costly training.

The condition for contract market success that traders have heterogeneous goals requires reinterpretation given that an insurance market is proposed rather than a conventional derivatives market. Rather than long and short hedgers roughly balancing one another's positions, the market maker (the insurance company) would always be on the long side of each profession's income index (i.e., each individual market) and policy holders would always be on the short side.⁸ Similar to conventional insurance markets where insurance companies are highly diversified across individuals, the insurance company would ideally be highly diversified across professions. Rather than requiring heterogeneous trader goals, this proposed market's success would depend on sufficient interest from diverse professions with risky income prospects.

Insurance is successful in settings where risks across policy holders are essentially uncorrelated, and loss probabilities can be reasonably evaluated. In the present setting, however, various professions' income indices would be correlated to some extent, some highly so. This situation would be similar to the familiar optimal portfolio allocation problem, were it not for the fact that the insurance company's portfolio would be determined by policy purchasers rather than being chosen the insurance company itself. The company's problem then would be to optimally set premiums given i) the expected policy portfolio that will result from future customer purchases and ii) some model of the joint dynamics of all income indices in the portfolio. This is very different from conventional actuarial analyses, conventional optimal portfolio allocation problems, and conventional derivative contract valuation problems. Solving such a problem represents a significant challenge that would need to be overcome before this proposal could be implemented.

The difficulty of the premium-setting problem will be intensified by significant informational limitations. As yet, the price indices that would underlie these contracts are not generated and maintained, and there is thus neither a basis for trading nor any labor income price index histories to aid in premium-setting. Such labor income index

⁸ Shiller makes no mention of the possibility of insurance companies selling policies to employers who are concerned about increases in a particular profession's income index. Selling policies to both sides of the market would seem to be a natural means of significantly reducing risk that the insurance companies would face in making such markets. The relative levels of buying interest that the insurance company experienced from each side of the market would also help them to discover appropriate premiums for each profession. This would be particularly helpful when setting premiums for policies covering new professions in rapidly evolving industries (just the type of professions that might show significant interest in purchasing policies) that have little or no income history and prospects that are difficult to evaluate.

histories are not likely to develop in the absence of trading, however, as this would be the primary application of these difficult and expensive to maintain indices. In the event that this initial data limitation could somehow be overcome (say with government establishment of such indices for some period before trading started), there would still remain ongoing data issues. As the example presented in Shiller (2003) illustrates, such insurance would find its most likely customers among those considering embarking on a career in a highly specialized profession based on a just-emerging scientific sub-discipline or technology, with highly uncertain prospects. By definition, however, such a profession will have no significant income index history that could aid in premium setting. For these reasons, premium-setting based on historical data appears to be of limited applicability.

The alternative would be to set premiums based on subjective evaluations of the uncertainty surrounding each profession's prospects, and the interrelations among those prospects, quite possibly resulting in significant, costly misjudgments on the part of a potential underwriter. This model uncertainty, combined with a lack of markets available for laying off underwriter risk, suggests that it may be very difficult to entice a market-making function for such markets (i.e., an insurance concern willing to write such policies), one of the necessary conditions for market establishment and success.

Commodity-linked Developing World Debt

Caballero (2003) offers a proposal aimed at stabilizing the sometimes dramatic capital flow reversals occasionally experienced by developing countries. Such reversals may or may not eventually result in full blown economic crises, but a country is sure to endure significant economic and social hardship regardless of whether or not crisis-averting countermeasures prove effective. He observes that such reversals are often precipitated by a decline in the price of a commodity that the country exports in large quantity; and on which the country's economy critically depends. Given this state of affairs, he reasons that instruments designed to hedge the country's commodity price exposure would, by backward induction, forestall the capital flight and currency attacks typically associated with a significant deterioration in the commodity's price, thus obviating the need for unpleasant countermeasures. Caballero specifically proposes that the external debt of developing countries should embed relevant commodity price floors (i.e., series of put options). Specific countries that he suggests might benefit from such commodity-linked bonds include Chile (copper), Mexico (crude oil), Brazil (coffee), Russia (crude oil), and South Korea (semi-conductors).

This proposal successfully fulfills many of the conditions necessary for contract market success. Significant price uncertainty is associated with the relevant commodities, providing the impetus for trade, and there exist clearly defined and observed commodity prices that would provide a basis for trade and settlement. Giving the debt-issuing country the benefit of the doubt, we could rate the proposed contracts as having a favorable counterparty risk profile.

Less favorable is the relationship between the proposed contracts and existing contracts. Caballero argues that existing commodity derivative markets cannot absorb risks of the

magnitude that commodity export-dependent developing countries face. However, there is no particular reason to believe that simply coupling the commodity price risk with the high-yield interest rate and default risks associated with developing countries' external debt is going to result in any increase in speculative and long hedging interest in a particular commodity. Caballero suggests that collateralized debt obligations (CDOs) might be used to decouple the commodity price risk from the issuer's default risk, so that investors with no country-specific expertise could absorb the former. In any event, there must exist counterparties willing to absorb the commodity price risk, regardless of whether this happens in the market for the commodity-linked bonds, the market for a CDO's default risk-free bond tranches, or in existing (pre-decoupled!) commodity futures and options markets. In short, coffee, crude oil, and copper futures and options markets already exist.

The most troubling aspect of this proposal, however, is that a significant moral hazard problem would exist for most intended applications. Consider some facts surrounding proposed Chilean copper-linked debt, which serves as Caballero's primary example.

- In 2001, Chile accounted for 35% of world mine production of copper (Edelstein, 2002)
- Codelco, the state-owned copper giant, holds approximately 70% of national copper reserves (Latin-Focus).

It would thus seem that Chile (the national government in particular) has substantial potential to influence copper prices. Reports from the financial press confirm this. Carpenter (2003) reports that on one day in December 2003 "copper futures in New York had their biggest gain in almost two-years after unions threatened to strike at a mine owned by Chile's Codelco, the world's biggest producer of the metal". Prices rose to a 6-year high on the mere threat that only 16% of Codelco's supply could be disrupted. There is little doubt, then, that Chile could, if it so desired, greatly increase world copper production in the intermediate or longer run. By doing so, it would simultaneously sell large amounts of copper and profit on the resulting contingent claims payoffs. If investors would be willing to buy such bonds at all, they would do so only at very unfavorable prices. The equilibrium in a market for the proposed instruments would necessarily take into account Chile's likely level of output *given its hedge*, and the implications of that level of production for copper prices.

Similar moral hazard problems plague the other suggested applications: Brazil accounted for 42% of total world production of coffee in the 2002/2003 season (USDA, 2003), and Mexico accounted for an estimated 4.8% of total world production of crude oil in 2002 (EIA 2003). The possibility of Mexican oil-linked bonds may be a somewhat more reasonable suggestion than the others, but given the highly inelastic demand for oil this is still questionable. In the end, the only useful application of commodity-linked developing country debt that would steer clear of moral hazard problems would be associated with a country that produces only a tiny portion of world output, but whose domestic economy is highly dependant on exporting that production. For example, coffee prices have a significant impact on the economy of Costa Rica, yet the country as a whole accounts for only approximately 2% of world production.

V. Conclusions

Academia and the finance industry generate a large number of proposals for new contract markets. Of these proposals, many will never be instituted, and the majority of those that are will fail. The purpose of this paper is to review the conditions that promote market success, and to assess the disposition of several current proposals with regard to those conditions.

We find that the conditions that promote market success have mostly been previously identified in the literature. We take some exception, however, to the conventional wisdom that a low correlation between the values underlying the new and existing contracts is a prerequisite for contract market success. Correlated markets allow an avenue through which liquidity providers can lay off risk, may allow hedging of economic transformation activities, or may provide relief from contract lumpiness problems.

Some patterns emerge from our analyses of current contract market proposals. All proposals seem to fairly carefully consider the extent of hedging use that a new contract might enjoy, and the extent of variability in the value that would underlie the new contract. Indeed, the perceived existence of a hedging need is often the inspiration for a proposal. With regard to the other characteristics of successful markets, however, there is significant variation across proposals. Proposals emanating from the academy often fail to fully consider all of the remaining factors, particularly the means by which liquidity will be provided in the fledgling market. These proposals typically face significant hurdles that must be overcome before the proposed markets could achieve success, or, in some cases, before they could even be implemented at all. By contrast, proposals emanating from the finance industry, such as the economic derivatives proposal, are more likely to have considered all factors that promote contract market success, and have commensurately brighter prospects.

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Table 1: Numbers of Futures Markets Listed in the *Wall Street Journal*

Category	Number of Markets Listed January 2, 1979	Number of Markets Listed January 2, 2004
Commodity	32	30
Interest Rate	3	22
Foreign Exchange	5	10
Index	0	21
Total	40	83