Undated Futures Markets*

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This article discusses the mechanics, economics, advantages, and disadvantages of undated futures markets with specific reference to the Chinese Gold and Silver Exchange Society of Hong Kong (CGSES). It also suggests a potential application of undated futures markets to the trading of stock index futures.

An undated futures market is an alternative to conventional futures markets. In conventional futures markets contracts mature at selected times during the year. Several contracts with different maturity dates trade simultaneously. In an undated futures market only a single contract trades, but that contract can serve the hedging purposes of the multiple contracts traded in a dated market. The CGSES is of interest both as a *curiosum* and as an example of a potentially valuable form of futures market.

The following section of this paper describes the operation of an undated futures market and the specific mechanics of trading on the CGSES. Sections II and III discuss the economics of price determination and hedging in undated futures markets. Section IV describes the advantages of undated futures markets to futures traders and points out potential problems in certain applications. Section V shows how such markets might be adapted to the US, especially for trading futures on a stock index or on other indices, and Section VI is a conclusion.

I. TRADING AT THE CHINESE GOLD AND SILVER EXCHANGE SOCIETY

The CGSES trades both gold and silver, but most trading is in gold contracts.[1] The gold contract calls for delivery of 100 taels (1 tael equals 1.2 oz.) of gold in the form of twenty 5-tael bars, 99% fine. Both parties to a transaction post margin and the maintainance margin level is 75% of the original margin. The exchange sets limit prices and trading is suspended if prices change by the limit amount. Trading on the exchange is active. Daily trading volume can exceed one million taels.

All trading at the CGSES is at spot prices. Traders can take or make delivery at the end of the trading day of the gold they purchase or sell. They may,

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[1]The information about the Chinese Gold and Silver Exchange Society in this paper was gleaned from "A Survey of the Hong Kong Gold Market" by Sun Hing Kai Securities Ltd. March 1981. A briefer, albeit livelier, account of the market can be found in Green (1981).

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however, choose to defer making or taking delivery. The contract will be rolled over as long as they continue to make settling payments.

Settling is markedly different from settling in conventional futures markets. The settling payment consists of two components. First, traders make or receive a payment reflecting the change in the *spot* price since the previous settlement, or since purchase if the contract was initiated that day. Second, they make or receive a payment which the CGSES calls "interest." This is a payment made for the privilege of deferring making or taking delivery. The interest payment has no analogue on a dated futures market. It may be "positive," paid by sellers to buyers, or "negative," paid by buyers to sellers.

The CGSES fixes the amount of the interest payment once a day in a Walrasian auction. On the basis of an initial interest quotation, buyers who wish to take spot delivery declare the amount they want to purchase and sellers quote the amount they wish to deliver. If quantity demanded does not equal quantity supplied, the interest payment is adjusted. Quoting and adjustment continue until spot quantity demanded equals quantity supplied. An excess demand for spot gold can be offset with a smaller negative or greater positive interest. This induces buyers to forego delivery in return for more interest received, or less paid. Suppliers, in turn, are willing to make delivery of more gold, because of smaller interest received or greater interest paid. An excess supply of spot gold would, of course, call for adjusting interest in the opposite direction.

A trader can, therefore, take out a contract and hold it for an indefinite period. To continue to hold the contract the trader must continue to provide cash to settle and to make interest payments as necessary. The trader can end this arrangement either by agreeing to make or take immediate delivery during the interest fix, or by taking an offsetting contract as in a conventional futures market.

Suppose, for example, that a trader purchases a gold contract at $388/oz. (although trading is actually in tael bars and Hong Kong dollars, this discussion is phrased in ounces and US dollars). Gold subsequently settles at $390 and the interest settles at a negative 50 cents. $1.50 per oz. would be added to the trader's margin account— $2 marking to market the increase in price, less the 50 cent daily interest charge.

If the price falls to $386 the next day and the interest moves to a negative 55 cents, the trader's margin account would drop by $4.55 per oz.—the $4 drop in price plus the 55 cent interest charge. If the trader takes an offsetting short position the third day at $387, a final deposit of $1 is made to the margin account.

II. PRICE DETERMINATION IN AN UNDATED FUTURES MARKET

Two prices must be determined in an undated futures market. The first is the spot price of the commodity traded. This would, presumably, be the same as the price determined on a conventional futures market for a contract in its delivery month. The second price is the interest charge.

In a conventional futures market, traders incur neither a cash inflow or outflow on taking a futures position. The market sets the futures price so that the value of the contract is zero (see Cox, Ingersoll, and Ross (1981), Jarrow

and Rudd (1981), and Richard and Sundaresan (1981) on the pricing of futures and forward contracts). On an undated futures market all transactions are at the spot price rather than a futures price. Therefore, the value of the undated futures contract is not zero. Since settlement and interest payment are both made daily, the interest payment is the value of a one day forward contract written with a price equal to the spot price.

The interest payment is basically a carrying charge, and its sign and magnitude depend on the economics of the particular commodity market. The gold market, for example, is priced with positive carry. In other words, the futures price exceeds the spot price by the cost of carrying the spot commodity for the life of the contract. The cost of carrying gold is very close to the rate of interest. The interest charge on an undated futures market would normally equal the interest which could be earned by investing an amount equal to the value of the gold on the money market plus the cost of one day's storage. To use the terminology of the CGSES, interest would be negative. That is, the holders of long positions would pay the holders of short positions not to deliver. This would equate the cost of carrying gold in physical form and the cost of carrying a long, undated futures position.

A business needing gold in inventory would, except for transactions costs, be indifferent between holding physical gold while foregoing interest on the amount invested, and taking a long position in an undated futures contract, paying daily interest, and taking delivery when gold is needed.

If the interest payment were any greater, traders could arbitrage by buying physical gold, paying to store it and selling a futures contract against it. The difference between the cost of storage plus interest foregone and the daily interest payment received would be pure profit (this ignores the impact of interest earned or foregone on the daily marking to market due to changes in the spot price).

On the other hand, if the interest payment were lower, holders of physical gold would have an incentive to sell it and purchase a long position in the futures market. They could then profit every day by the difference between the interest charged by the futures market and the interest earned on the money obtained from the sale of gold plus the storage costs they don't have to pay. If the gold were needed later, they could take delivery.

III. HEDGING IN UNDATED FUTURES MARKETS

As in a conventional futures market, the risk to a hedged position in an undated futures market, i.e., basis risk, stems from the riskiness of the carrying charge in the market. In a conventional futures market this carrying charge is reflected in the basis. In undated futures markets the carrying charge risk is reflected in uncertainty about the interest component of the settling payment. For commodities with a carrying charge close to the interest rate, this uncertainty is small relative to the uncertainty about the spot price of the commodity, and risk to a hedger would be minimal.

For commodities for which the risk relating to carrying cost is low, the risk associated with hedging in an undated futures market is very much like the risk of hedging in a dated futures market.

On the other hand, in a market where spot prices move seasonally, the interest charge would reflect the anticipated change in the spot price when, for example, a new crop was harvested. A farmer could not, therefore, use the futures market in June to lock in a firm September price for a crop in an undated futures market. The degree of uncertainty about the future carrying charge would be close to the magnitude of uncertainty about the future spot price. Futures markets were first used in the US for agricultural products. Not surprisingly, the markets were, and are, dated futures markets.

IV. ADVANTAGES OF UNDATED FUTURES MARKETS

For many hedgers, an undated futures market offers several advantages over the conventional futures market. Hedgers would be exposed to less basis risk, could economize on transactions costs and would trade in deeper markets.

Basis Risk

In dated futures markets, trading is only offered in a few contract months per year. A hedger who wishes to make or take delivery of a commodity in a noncontract month must, therefore, cross-hedge by taking a position in a contract month. The hedge must be lifted at the prevailing price in the futures market. The trader is exposed to basis risk in the form of the difference between the futures price and the spot price. Batlin (1983) shows that this risk can affect the output of a rational, risk-averse producer. On an undated futures market, regardless of when the hedge is lifted, it is lifted at the current spot price of the commodity. Therefore, hedgers are exposed to less basis risk.

Many traders on futures markets are cross hedgers. For example, a bond trader might hedge a position in corporate bonds with a T-bond futures contract. Cross-hedgers do not wish to make or take delivery of the commodity used to form the hedge. In a conventional futures market, cross-hedgers with long positions must abstain from trading in the delivery month to avoid delivery of an unwanted commodity. Thus, a cross-hedger with a short hedging horizon is forced into a more distant contract month. For the cross-hedger in a conventional futures market, therefore, the basis consists of two components: First, the spread between the spot price of the hedged commodity and the spot price of the commodity on which futures are traded, and, second, the difference between the spot price of the commodity on which the futures contract is written and the futures price. In an undated futures market only the first of these components of basis risk exists, since the hedge is always lifted at the current spot price of the traded commodity.

Transactions Costs and Market Depth

In U.S. futures markets, trading and open interest is vastly larger in the nearby futures contracts than in distant futures contracts. A quick look at the *Wall Street Journal* (March 25, 1987) shows that 83.3% of the open interest in

treasury bond futures and 98.5% of the open interest in S&P 500 stock index futures is in the nearby contract, although seven delivery months trade in bonds and three trade in index futures. Therefore, in a conventional futures market, a large hedger might choose to hedge with the nearby contract even for a long-term hedge. Attempting to take a large position in a thinly traded month might cause a substantial adverse price movement. Taking a position in the nearby contract, however, means that the position must be repeatedly rolled over before the hedging period ends. Thus, longer term hedgers could incur substantial transactions costs, i.e., brokerage costs and bid-ask spread, because they must make several round turns in nearby contracts.

In an undated futures market, only one contract is traded. Therefore, all trading activity is forced into the single contract which makes the market for that contract deeper. A contract can be held for an indefinite period, so a trader wishing to establish a long-term hedge can do so by paying only a single round turn fee and incurring the bid-ask spread a single time.

On the other hand, because of the carrying charge risk discussed above, an undated futures market is probably an inappropriate mechanism for trading certain commodities. Specifically, for agricultural commodities with pronounced seasonal movements in the spot price the undated futures market is an unattractive alternative to the conventional futures market.

V. IMPLEMENTING AN UNDATED FUTURES MARKET FOR STOCK INDEX FUTURES

The chief problem in devising trading rules for an undated futures market is that two prices must be quoted—a spot price and an interest rate. In the CGSES this is handled by setting aside a separate time for setting the interest charge. All other trading is done at the spot price. Such a system might also work in the U.S. After the close of spot trading another, shorter, trading session could take place at which traders would bid for the right to make or take delivery, or, alternatively, bid for the right *not* to take delivery.

A more flexible market would continuously adjust both the interest charge and the market price. For example, a market might have simultaneous spot and futures trading. All futures positions would be initiated at the last quoted spot price and the actual number set in the futures transaction would be the interest charge. The contracts would be marked to the market daily using the change in the spot price and a settling futures price (for existing positions) or the negotiated futures price (for new positions). This would require a substantial spot market, however, to guarantee the continual updating of the spot price. In most markets the trading in futures vastly dominates spot trading. Since the spot price is likely to be substantially more volatile than the interest charge, this price should be set in the futures pit as well.

In one important market, however, a continuous spot market constantly updates a well-defined spot price—the stock index futures market. Index quotes are available at frequent intervals during the trading day.

An undated stock index futures market could be organized in any of several ways. If the spot index could be quoted at regular intervals to traders in the pit, then all trading in the pit could be carried out in terms of the last quote

plus interest. In other words, the traders would quote interest figures only, and the trade would be marked to market after trading on the basis of the last index quote before the trade was executed.

For example, suppose that the index has just been quoted at 221. A trade is then executed at an interest charge of 50 cents. If the market closes that evening at 222, the long position would receive 50 cents—the $1 change in price less the 50 cent interest charge (per index unit in the contract—the S&P index futures contract is 500 times the index value, so $500 would be added to a contract position for a $1 move in the index). The interest charged on open contracts would be set based on trading as the pit closed. If the market had closed the previous day at 220, and if the interest charge quoted in the pits at close of market was 45 cents, then a long position would receive, and a short position would pay, $1.55—the $2 gain in price less the interest charge.

The interest should be slightly higher in the morning than at the close of the market, since someone purchasing a contract in the morning would pay an interest fee that would allow carrying the contract without further charge until the close of trading the next day. A trader who opened and closed a position during the day would pay or receive a settling amount equal (for a long trader) to the difference of the two index values at which the trades were carried out less the difference of the two interest fees.

Alternatively, traders could trade at futures prices, but the settling cash flow on the contract would equal the index value less the previous day's futures settling price. If a trader holding an existing long contract took an offsetting position during a day, the net cash flow in the margin account for that day would equal the futures price at which the contract was closed, less the settling futures price the preceding day. For a trader taking a long position during the day, the cash flow in the margin account would equal the difference between the final index value and the futures price at which the contract was initiated.

The futures price would be above the spot price by a one-day carrying charge. Thus, if the spot price were unchanged over the trading day, the settlement would equal a one-day cost of carry.

There would have to be a trading session after the final value of the index for the day had been recorded in order to set a futures price for the day. The futures price would fall towards the spot index value during the day and then start the post-stock market close session at a higher value.

For example, suppose a trader takes a long position in a stock index futures contract at a price of 110. That night the index closes at 111 and the futures contract settles at 111.15. $1 is added to the trader's margin account. The next night the market index is 109 and the futures contract settles at 109.20. The clearinghouse would reduce the trader's margin balance by $2.15 (111.15 – 109). The third day the index closes at 110 and the futures contract settles at 110.15. The trader's margin account would increase by $0.80 (110 – 109.20). Finally, on the fourth day the trader takes an offsetting short position at a futures price of 111.10. That night the trader's margin position would receive a final 95 cents (111.10 – 110.15). For a short position, of course, the cash flows would be reversed.

The pricing of undated stock index futures would be similar to the pricing of gold futures described above, with the additional consideration of dividends paid on the index. If the index on which the futures contract is written were

(as all existing futures indexes are) nondividend compensated, the difference between the closing futures price and the value of the index would represent one day's interest on a position in the index less the value of the dividends which would accrue to holders of the index portfolio the next day. For example, suppose the index closes at 110, the interest rate is 15%, and stocks in the index portfolio will go ex-dividend on 50 cents worth of dividends tonight (a holder of the index portfolio today will receive the dividends, a purchaser of the index portfolio tomorrow will not receive the dividends). One day's interest on $110 at 15% is 4.5 cents. Adding the interest and subtracting the dividend gives 109.545 as the closing value of the futures contract. Because all traders could know every day which stocks would go exdividend that evening, the dividend adjustment to the index futures price would not involve the approximations which it does in existing longer-term stock index futures contracts.

Suppose that the next day no price change other than that caused by stocks going ex-dividend occurs. In that case the index would close at 109.50. Traders holding long positions in the index would lose 4.5 cents from their margin accounts. Traders holding a hedged position in the index portfolio—a long position in the portfolio and a short position in the index futures contract—will end the day with a portfolio worth 109.5, claims on 50 cents worth of dividends (neglecting the discounting of the dividend from payment date to present value) and an inflow of 4.5 cents from the margin account. In other words, a fully hedged portfolio simply pays the risk-free rate.

Alternatively, of course, the index on which futures are traded could be dividend compensated. In that case, the interest portion of the settling payment would reflect only the opportunity cost of funds and not dividend payments. Such an arrangement would reduce the risk involved in a long-term hedge in an undated stock index futures market.

Two additional advantages of undated stock index futures over dated markets are worth noting. First of all, when the existing contracts mature traders unwinding stock positions hedged against the maturing contract have occasionally disrupted the stock market. The popular press has been replete with discussions of the "triple witching hour" when futures, options on futures, and index options all expire. Since an undated futures contract "matures" every day there would be no need for a concentration of trading activity on a single day. The triple witching hour would be reduced to a double witching hour.

Secondly, the futures contract could be used for hedging against an option on a stock index, as opposed to an option on a stock index futures contract. Or, alternatively, an option on the contract would be priced exactly like an option on an index. On the last day of a conventional futures contract the exercise value of an option on the futures contract is the same as the exercise value of an option on the index. On any day before that, the exercise values of the futures option and the index options differ by the spread between the futures price and the index value. Since the undated futures market converges to the index value every night, this would not be a problem for the undated futures contract.

Finally, the reduction in transactions costs could encourage the further use of index futures contracts in long-term hedging programs. Rubinstein (1985) notes that a disadvantage of using conventional futures contracts to establish "portfolio insurance" through continuous trading is the necessity of rolling the

contract over periodically. This exposes the investor to some basis risk and also increases transactions costs. With an undated futures market this portion of basis risk is removed and the only transactions costs are those incurred when taking the hedged position, adjusting it as necessary, and liquidating it on the final day of the insurance period.

Similar contracts could, of course, be traded in other indexes. Bond indexes, interest indexes, and the CRB index all would lend themselves to undated futures contracts.

VI. CONCLUSION

The Chinese Gold and Silver Exchange Society provides an apparently unique example of an undated futures market. In this market all trading takes place at the spot price. Traders who wish to carry the position overnight incur an interest charge. This is usually paid by the traders with long positions to traders with short positions. The interest charge is adjusted to make the quantity of gold which traders with short positions wish to deliver equal to the quantity of gold which traders with long positions demand.

In general, this interest charge should equal the cost of carrying the commodity. In the case of gold, the carrying cost is close to the one-day rate of interest times the value of the contract. In the case of stock index futures, the carrying cost would have to reflect the value of dividends paid by the index portfolio.

This form of market organization has several advantages. First, only a single contract trades. Therefore, the market is deeper than a conventional futures market with the same volume of trading. Second, a contract can be held indefinitely so a trader need not roll over contracts to carry out a long-term hedge. Third, whenever a contract is executed, or an offsetting position is taken, the basis for the settlement is the current spot price. This reduces the basis risk in hedging. The market is most attractive for commodities such as metals or financials for which the futures price simply reflects the spot price plus the cost of carry. It would be less attractive for agricultural commodities because of a substantial carrying charge risk.

Appendix

Spot Trading on the Toronto Futures Exchange

A stock index market similar in some ways to the one discussed in this article has been established on the Toronto futures exchange. Their spot contract allows intra-day trading of the Toronto Stock Exchange (TSE) 300 index, but does not permit holding the position overnight.

A trader may take a long or short position on the index at any time during the day. Both long and short sides of the transaction post margin. If the trader closes the position later in the day, the margin is adjusted to reflect the change

in the value of the contract. At the end of the day all positions in the spot index are marked to market at the closing value of the index and are closed out. No positions are carried overnight.

Clearly, the disadvantage of this contract for hedging is that it must be re-established every day. Every contract must be reestablished every day and a round-turn fee must be paid to a broker. Even traders with seats on the exchange, must trade into the bid-ask spread.

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