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SIMPLE PRICE MONITORING TOOL TO ASSESS MONTHLY CHANGES IN FOOD PRICES

A simple price monitoring tool to assess monthly changes in food prices

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Introduction

Food prices have always been volatile, but they may become even more volatile in the future given the new linkages between oil and grain prices. These new linkages are due to several factors that have converged in the past few years. While technologies that can convert grains to fuel have existed for some time, it is only recently that they have become profitable enough to create a stronger link between oil and grain prices than has existed in the past. In addition to improvements in biofuel technologies, policies in several developed countries (e.g. mandates, tariffs) have also played a key role by lowering the level of oil prices at which this linkage becomes operable. Finally, developments in supply and demand in world oil markets also play a role: if oil prices are at a relatively high level in the medium term due to continued economic growth in developing countries and increased difficulties in finding new cheap sources of supply, this makes it easier for grains to be competitive as a source of fuel, providing yet another reason why there are likely to be stronger linkages between grain prices and oil prices.

The linkage between oil prices and grain prices serves to increase demand for grain, leading to higher grain prices than would otherwise be the case. Along with declining cereal yield growth rates (at least for rice and wheat) and continuing rapid economic growth in developing countries that leads to diversified diets and creates additional feed grain demand, there is reason to believe that world grain prices will be higher in the next decade than they were in the late 1990s and early years of this century.

Perhaps more important than the additional demand, however, is the fact that oil prices have historically been much more volatile than grain prices. If grain prices are linked to oil prices, then we would expect that grain prices will be more volatile than they have been in the recent past, and indeed, volatility in grain markets has increased in the past two to three years (changes in futures markets regulations may have also played a role). If world grain prices remain volatile, this will present a major policy challenge to developing countries that want to protect their farmers and consumers from price surges that have serious effects on income distribution, investment and nutritional outcomes.

Market prices are critical sources of information for policymakers. They aggregate and integrate the information held by millions of economic agents, including their expectations regarding likely short-term developments in supply and demand. For

example, if farmers and traders in a particular region notice that the crop is not developing well, they may try to increase stock levels in anticipation of further price increases. This behavior will influence market prices and send signals to other traders in other regions. Of course, markets do not work perfectly, but nevertheless prices are extremely valuable sources of information about expectations of the future. Furthermore, prices can be observed on a frequent basis (in contrast to estimates of production). Because they can be observed frequently and contain so much information, prices are powerful tools to assess the state of food security on a short-term basis for both farmers and consumers.

This paper presents a simple tool that can be used to monitor developments in market prices. The data requirements are relatively simple: all that is needed are monthly data on nominal market prices and the consumer price index (CPI). At least seven years of data are highly desirable, although it is possible to work with less if necessary. Given appropriate data, the price monitoring tool can be used for any level of the marketing system (farm, wholesale, retail). It can also be used for any type of food commodity, although staple foods such as rice, wheat and maize are the most likely candidates because of their importance to large numbers of farmers and consumers.

The price monitoring tool can be implemented in any spreadsheet, e.g. Microsoft Excel. The process of updating the spreadsheet every month can also be automated using Microsoft Access. The final output is a graph that shows past trends in prices as well as "benchmarks" for future price developments. Before discussing this output and its interpretation, the paper will describe the spreadsheet calculations that are done to monitor price developments.

The spreadsheet calculations

In general terms, the price monitoring tool tries to alert users to situations when prices are changing (increasing or decreasing) relatively quickly after taking into account seasonality and inflation. In some cases, this will be obvious, and the price monitoring tool is redundant. For example, if rice prices increase in one month by 30% in a country where annual inflation is about 10%, then such an increase is clearly much more rapid than is normal. In other cases, however, the conclusion may not be so obvious. For example, if rice prices increase or decrease by 2% in a particular month, is that too rapid or about normal? The price monitoring tool described in this paper should be helpful in such ambiguous situations.

The example will use data on wholesale coarse rice prices in Bangladesh. Figure 1 contains the spreadsheet columns used in the price monitoring tool. Figure 2 shows the same spreadsheet columns, except with the underlying formulas displayed instead of the numbers. The first two columns (A and B) are the month and year, column C is the nominal price (data), and column D is the consumer price index, or CPI (data). These are self-explanatory and are identical in Figures 1 and 2 (because they are data, not calculations).

Column E is the real price (please see Figure 1.A and Figure 2.A for this example). The real price adjusts nominal price data for inflation. It is calculated as the nominal price times a ratio of CPI index numbers. For example, to calculate the July 1975 rice price in August 2006 taka, multiply the July 1975 nominal price times a ratio. This ratio is the CPI in August 2006 divided by the CPI in July 1975. What does this ratio tell us? The ratio of two CPI index numbers tells us the factor by which prices have changed between the two time periods. In Bangladesh, the CPI in July 1975 was 20.3, while in August 2006 it was 170.9. Taking the ratio of these two numbers gives 170.9/20.3 = 8.42, which means that, on average, prices of most commodities were 8.42 times higher in August 2006 than in July 1975. This can be considered the impact of monetary policy, which allows prices of nearly all goods and services to increase over time. Thus, if the fundamental rice market conditions of July 1975 (including population, weather, demand, supply, and world market conditions) were to exist in August 2006, when prices were 8.42 times higher than in July 1975, the price of rice would be equal to 528 taka per quintal (the nominal price in July 1975) times 8.42, or 4445 taka per quintal. This compares to the August 2006 price of rice of 1584 taka per quintal. Thus, measured using the value of taka in August 2006 (which are much less valuable than taka in July 1975), we can see that rice was very expensive in July 1975 compared to today. This is not surprising, since this was during the world food crisis when rice prices were very high in all Asian countries and on the world market in the aftermath of severe El Nino and La Nina events.

Before moving to column F, I will present one more example of a real price calculation; calculate the August 1997 rice price in August 2006 taka (this example is not shown in the figures). First, let us take the ratio of the two CPI index numbers. Since the CPI in August 1997 was 109.1, and the CPI in August 2006 was 170.9, the ratio is equal to 1.57. This means that the prices of most goods and services in August 2006 were 1.57 times as high as in August 1997, or 57% higher. Thus, if the rice market conditions of August 1997 (including population, weather, demand, supply, and world market conditions) were to exist in August 2006, when general prices were 1.57 times higher than in August 1997, the price of rice would be equal to 938 taka per quintal (the nominal price in August 1997) times 1.57, or 1469 taka per quintal. This compares to the August 2006 price of rice of 1584 taka per quintal. Thus, measured using the value of taka in August 2006 (which are less valuable than taka in August 1997), we can see that rice was relatively cheaper in August 1997 compared to August 2006.

Column F is a moving average of real prices from column E. For example, the moving average for September 2005 is calculated as the average of prices in all 12 months between March 2005 and February 2006 (please see Figure 1.B and Figure 2.B for the rest of the examples in this paper). For any given month, it is just an average of the surrounding 12 months. It is called a moving average because the months used to calculate the average move, or change, as the month for which the average is being calculated changes. For example, the moving average for October 2005, just one month later, is the average of prices in all 12 months between April 2005 and March 2006. Notice that the months used to calculate the average move forward one month as the

calculation moves forward one month from September to October. Why calculate a moving average? Please see the notes for Column G.

Column G is the ratio of the price in any particular month to the moving average price for that month. This is the first step in calculating a seasonal factor. This ratio tells us how high or low the price in a particular month and year (e.g. March 2005) was compared to the price in surrounding months. For example, the ratio for March 2005 is equal to 1.05. This tells us that the real price in March 2005 (1749 taka per quintal, taka being August 2006 taka) was 5% higher than the average price between September 2004 and August 2005 (which was 1668 taka per quintal).

Column H calculates the seasonal factor for each month. It is the average of the ratio column (column G) over the past seven years for the same month. Thus, cell H373 calculates the average of the past 7 ratios for the month of March. You can confirm that all the cell references in cell H373 = (G301+G313+G325+G337+G349+G361+G373)/7 refer to the month of March, i.e. G301 is March 2000, G313 is March 2001, G325 is March 2002, and so on. The following table shows the value of the ratio in each of the 7 cells noted above.

Cell Address	Date	Ratio
G301	March 2000	1.03
G313	March 2001	1.02
G325	March 2002	1.05
G337	March 2003	1.05
G349	March 2004	1.03
G361	March 2005	1.05
G373	March 2006	1.02

Thus, compared to surrounding months, real prices in March are sometimes 2% above (2001, 206), sometimes 3% above (2000, 2004), and sometimes 5% above (2002, 2003, 2005). On average, real prices in March are about 4% greater than real prices in surrounding months. This is the seasonal factor for March, 1.04.

Columns I and J make a very minor adjustment to the seasonal factors calculated in column H in order to calculate the normalized seasonal factor. By definition, the average of the 12 seasonal factors for the 12 months should be exactly 1.00, which means that the sum of the 12 seasonal factors should be exactly 12.00. However, for the seasonal factors calculated in cells H362 to H373, the sum is equal to 11.97 (see cell I373). Thus, in order to create the normalized seasonal factors, it is necessary to multiply all the seasonal factors in column H by the ratio of 12/11.97 to create the normalized seasonal factors in cells J362 to J373. Notice that the normalized seasonal factors in column J are almost identical to the seasonal factors in column H. This is because the ratio of 12/11.97 is almost equal to 1 (it is equal to 1.003).

Column L just copies the nominal price data from column C (column K is intentionally left blank).

Column M calculates the prices that would have prevailed if prices had been at normal levels (calculated as the average real price over the past four years[1]) and had followed normal seasonal patterns. In cell M376, corresponding to June 2006, this is calculated as =AVERAGE($E$331:$E$378)*J364, where J364 is the seasonal factor for June and average ($E$331:$E$378) is the average real price from September 2002 to August 2006. The product of these two factors is a real price in terms of August 2006 taka. It is now necessary to convert this to a nominal price in terms of June 2006 taka, so that it can be properly compared with the nominal price in June 2006. In order to do this, multiply by the ratio of two CPI index numbers, the CPI in June 2006 divided by the CPI in August 2006. This ratio of two CPI index numbers is equal to 169.3/170.9, or 0.991, and this ratio is multiplied by the other two factors noted above.

The rest of the cells in column M are calculated in similar fashion. However, for the final two cells, corresponding to September and October 2006, there are no data for the CPI at the time the November benchmark is being calculated (cells D379 and D380 are empty). Thus, an estimate of the CPI must be made for those two months in order to calculate the ratio mentioned in the paragraph above. For the September 2006 CPI, the estimate is calculated as the August 2006 CPI times the average monthly inflation during the past 12 months, which is calculated as (August 2006 CPI/August 2005 CPI) raised to the power of (1/12). Thus, the September 2006 CPI is estimated as:

September 2006 CPI = August 2006 CPI*(August 2006 CPI/August 2005 CPI)$^{(1/12)}$

September 2006 CPI = 170.9*(170.9/160.3)$^{(1/12)}$ = 170.9*1.005396[2]

Next, the ratio of the September 2006 CPI to the August 2006 CPI becomes

= 170.9*1.005396/170.9 = 1.005396

after canceling out the August 2006 CPI in both the numerator and the denominator. The final value of 1.005396 just comes from (August 2006 CPI/August 2005 CPI)$^{(1/12)}$, which explains the formula in cell M379. Cell M380 is calculated in a similar manner, but is done by estimating the CPI for October 2006 instead of September 2006.

Columns N, O and P are benchmarks of future prices. They are calculated by multiplying the current price (in this case, October 2006) by three factors: one for seasonality, one for inflation, and one for uncertainty.

The first factor is a ratio of seasonal factors. For the November 2006 price, it is the November seasonal factor divided by the October seasonal factor. In this particular case, the November seasonal factor is 0.99, while the October seasonal factor is 1.01. This means that real prices in November are typically below real prices in October. Taking this into account means that we must multiply the October price by 0.987/1.013 = 0.975.

[1] The choice of four years is arbitrary. Other numbers could also be used.
[2] Notice that (170.9/160.3)$^{(1/12)}$ = 1.005396 is not the same as 1+(170.9/160.3)/12 = 1.0889.

The next step is to multiply by an inflation factor because we expect prices to increase every month due to general inflation. The inflation factor is just the average monthly inflation factor during the past 12 months, which we calculated above as = $(170.9/160.3)^{(1/12)} = 1.005396$. Thus, after multiplying the October price by 0.975 due to seasonality, we multiply by 1.005396 to obtain 1570 taka.

The final factor is the uncertainty factor, designed to take account of the fact that prices do not always behave according to normal seasonal patterns. While the seasonal patterns calculated in column J are real patterns, they are averages and are not followed every year. For example, it was noted earlier that real prices in November are usually 2.5% lower than real prices in October (thus, the factor of 0.975). However, November prices are not 2.5% lower than October prices every year; if this were true, it would be easy to predict prices. Sometimes, the November price might be 4% higher, while at other times it might be 6% lower than the October price. The uncertainty factors are generated using country and commodity specific price data, and estimates of these factors for a given commodity in a given country should not be used for other commodities or other countries. The uncertainty factors are calculated so that prices should fall between the low and high benchmarks about 70% of the time. The other 30% of the time, prices will fall either above the high benchmark or below the low benchmark. The choice of 70% is arbitrary, and other cutoff points could be used.

An example of graphical output

Once the future price benchmarks have been calculated as described above, it is possible to create a graph similar to Figure 3.

The left hand side of Figure 3 has two price patterns. One is the actual pattern of nominal prices during June to October of 2006 – these are just raw data. The other pattern shows what prices would have been if they had followed normal seasonal patterns at a level equal to average real prices during the past four years. In this particular example, the two patterns are not all that different in terms of levels, but there are differences in terms of seasonal patterns. In particular, actual prices have risen much more slowly than would be expected during the past two months, although the level of prices in August was about normal. In other cases, the price levels can be quite different. In Figure 4, for example, which pertains to 1992 for rice in Bangladesh, one can see that actual prices during the months of February to June were below the general ("normal") levels of the preceding four years.

The right hand side of Figure 3 shows three levels of benchmarks for the evolution of future prices: middle, high and low. The middle benchmark shows how prices will evolve if normal seasonal patterns are followed and inflation is in line with experience during the past year. Of course, this pattern will almost never be achieved exactly in the real world. Thus, the high and low benchmarks are presented to give some boundaries to what is normal and what is abnormal. As mentioned earlier, the definition of what is normal is clearly arbitrary; here, normal is taken to mean 70% of the time.

If prices are changing within the 70% band, then it likely means that conditions in food markets are relatively stable. If, however, prices are above or below the 70% band, then it indicates that somewhat unusual events are taking place and it is worth the attention of policymakers to understand what factors are causing this situation and how it might be remedied. The price monitoring tool is not capable of understanding why prices are moving the way they are; however, it is capable of alerting users to situations when something unusual is taking place.

As a final note, it is worthwhile pointing out that this is not a price forecasting tool except in a very simple sense. For example, if prices go outside the 70% band, it does not indicate that the tool is doing a bad job. Rather, it indicates that there are unusual market developments. Similarly, if prices are inside the 70% band, it does not indicate that the tool is successful. Rather, it indicates that markets are behaving in a relatively normal fashion. Indeed, the tool is constructed so that actual prices will fall outside of the band 30% of the time. Such events are to be expected, but when they occur, it does indicate the need for policymakers to obtain more information about the causes underlying the state of food markets.

Figure 1.A.1

A	B	C	D	E	F	G
Month	Year	Price Tk/quintal	CPI	Real Price	Moving Avg	Ratio
Jul	1975	528	20.3	4445		
Aug	1975	429	20.6	3568		
Sep	1975	410	20.5	3416		
Oct	1975	386	20.5	3216		
Nov	1975	281	20.6	2334		
Dec	1975	284	20.5	2365		
Jan	1976	303	20.3	2551	2775	0.92
Feb	1976	303	20.8	2495	2599	0.96
Mar	1976	288	20.7	2375	2494	0.95
Apr	1976	279	21.4	2228	2400	0.93
May	1976	281	21.8	2200	2330	0.94
Jun	1976	271	21.9	2113	2324	0.91
Jul	1976	281	20.6	2327	2300	1.01
Aug	1976	279	20.7	2304	2262	1.02
Sep	1976	284	21.2	2290	2247	1.02
Oct	1976	295	21.2	2377	2256	1.05
Nov	1976	287	21.7	2259	2297	0.98
Dec	1976	263	21.6	2081	2343	0.89
Jan	1977	271	22.1	2095	2410	0.87
Feb	1977	297	21.9	2320	2476	0.94
Mar	1977	316	21.8	2473	2524	0.98
Apr	1977	348	21.8	2729	2578	1.06
May	1977	346	21.5	2752	2619	1.05
Jun	1977	372	21.9	2908	2644	1.10
Jul	1977	402	22.0	3120	2682	1.16
Aug	1977	381	22.5	2889	2728	1.06
Sep	1977	389	22.7	2936	2758	1.06
Oct	1977	389	23.2	2862	2786	1.03
Nov	1977	346	23.1	2559	2796	0.92
Dec	1977	340	22.9	2537	2781	0.91
Jan	1978	356	23.0	2651	2732	0.97
Feb	1978	356	22.8	2674	2656	1.01
Mar	1978	383	23.3	2815	2595	1.08
Apr	1978	394	23.6	2848	2543	1.12
May	1978	367	24.4	2569	2495	1.03
Jun	1978	351	25.8	2324	2475	0.94
Jul	1978	348	26.9	2210	2450	0.90
Aug	1978	346	27.4	2155	2422	0.89
Sep	1978	372	27.5	2313	2401	0.96
Oct	1978	372	27.9	2281	2391	0.95
Nov	1978	367	27.0	2320	2399	0.97
Dec	1978	354	27.1	2237	2427	0.92
Jan	1979	372	27.4	2322	2520	0.92
Feb	1979	389	27.5	2418	2637	0.92
Mar	1979	426	27.1	2690	2745	0.98
Apr	1979	472	27.4	2949	2830	1.04
May	1979	490	28.8	2904	2898	1.00
Jun	1979	581	28.9	3436	2947	1.17
Jul	1979	624	29.5	3621	2989	1.21
Aug	1979	603	29.9	3451	3037	1.14

Figure 1.B.1

A	B	C	D	E	F	G	H
Month	Year	Price Tk/quintal	CPI	Real Price	Moving Avg	Ratio	SeasFact
January	2003	1395	136.8	1744	1666	1.05	1.01
February	2003	1391	137.2	1734	1658	1.05	1.04
March	2003	1400	137.3	1743	1657	1.05	1.05
April	2003	1393	137.5	1731	1655	1.05	1.06
May	2003	1260	138.4	1556	1643	0.95	1.01
June	2003	1273	138.8	1567	1629	0.96	0.97
July	2003	1210	139.6	1482	1617	0.92	0.94
August	2003	1290	140.7	1567	1602	0.98	0.95
September	2003	1345	141.7	1622	1591	1.02	0.97
October	2003	1308	142.7	1567	1579	0.99	1.00
November	2003	1302	143.7	1549	1563	0.99	0.98
December	2003	1299	144.5	1537	1560	0.99	1.00
January	2004	1334	144.9	1574	1552	1.01	1.02
February	2004	1356	145.1	1598	1552	1.03	1.05
March	2004	1361	145.4	1600	1551	1.03	1.05
April	2004	1308	145.7	1535	1543	0.99	1.05
May	2004	1307	146.2	1528	1549	0.99	0.99
June	2004	1262	146.7	1471	1555	0.95	0.96
July	2004	1277	147.5	1480	1569	0.94	0.94
August	2004	1350	148.5	1554	1586	0.98	0.96
September	2004	1360	152.1	1528	1603	0.95	0.98
October	2004	1470	154.0	1631	1615	1.01	1.02
November	2004	1449	152.9	1620	1630	0.99	0.99
December	2004	1523	152.4	1708	1633	1.05	1.01
January	2005	1585	152.9	1772	1643	1.08	1.02
February	2005	1628	154.3	1803	1659	1.09	1.04
March	2005	1588	155.2	1749	1668	1.05	1.04
April	2005	1561	155.3	1718	1675	1.03	1.03
May	2005	1423	156.3	1556	1673	0.93	0.99
June	2005	1469	157.5	1595	1674	0.95	0.96
July	2005	1557	158.8	1676	1670	1.00	0.95
August	2005	1549	160.3	1652	1662	0.99	0.97
September	2005	1544	162.8	1621	1652	0.98	0.98
October	2005	1547	165.2	1600	1645	0.97	1.01
November	2005	1579	165.0	1636	1639	1.00	0.98
December	2005	1590	163.2	1666	1644	1.01	1.01
January	2006	1594	163.0	1672	1645	1.02	1.02
February	2006	1611	163.1	1688	1636	1.03	1.04
March	2006	1605	164.8	1665	1631	1.02	1.04
April	2006	1607	166.9	1646			
May	2006	1582	168.2	1608			
June	2006	1593	169.3	1608			
July	2006	1561	169.5	1574			
August	2006	1584	170.9	1584			
September	2006	1587					
October	2006	1602					
November	2006						
December	2006						
January	2007						

Figure 1.B.2

A	B	I	J	L	M
Month	Year	Sum	SeasFact Normalized	Actual Past Price	"Normal" Past Price
January	2003	11.97			
February	2003	11.97			
March	2003	11.97			
April	2003	11.98			
May	2003	11.97			
June	2003	11.97			
July	2003	11.96			
August	2003	11.96			
September	2003	11.96			
October	2003	11.97			
November	2003	11.98			
December	2003	11.99			
January	2004	12.00			
February	2004	12.01			
March	2004	12.01			
April	2004	12.00			
May	2004	11.98			
June	2004	11.97			
July	2004	11.97			
August	2004	11.98			
September	2004	11.99			
October	2004	12.01			
November	2004	12.02			
December	2004	12.02			
January	2005	12.02			
February	2005	12.01			
March	2005	12.00			
April	2005	11.99	1.04		
May	2005	11.98	0.99		
June	2005	11.98	0.96		
July	2005	11.99	0.96		
August	2005	12.00	0.97		
September	2005	11.99	0.98		
October	2005	11.99	1.01		
November	2005	11.98	0.99		
December	2005	11.98	1.01		
January	2006	11.98	1.02		
February	2006	11.97	1.04		
March	2006	11.97	1.04		
April	2006				
May	2006				
June	2006			1593	1551
July	2006			1561	1542
August	2006			1584	1581
September	2006			1587	1602
October	2006			1602	1665
November	2006				
December	2006				
January	2007				

Figure 1.B.3

A	B	N	O	P
Month	Year	Future Price Low Benchmark	Future Price Benchmark	Future Price High Benchmark
January	2003			
February	2003			
March	2003			
April	2003			
May	2003			
June	2003			
July	2003			
August	2003			
September	2003			
October	2003			
November	2003			
December	2003			
January	2004			
February	2004			
March	2004			
April	2004			
May	2004			
June	2004			
July	2004			
August	2004			
September	2004			
October	2004			
November	2004			
December	2004			
January	2005			
February	2005			
March	2005			
April	2005			
May	2005			
June	2005			
July	2005			
August	2005			
September	2005			
October	2005			
November	2005			
December	2005			
January	2006			
February	2006			
March	2006			
April	2006			
May	2006			
June	2006			
July	2006			
August	2006			
September	2006			
October	2006			
November	2006	1507	1570	1633
December	2006	1531	1611	1692
January	2007	1541	1639	1737

Figure 2.A.1

A	B	C	D
Month	Year	Price Tk/quintal	CPI
Jul	1975	528	20.3071276767319
Aug	1975	429	20.555428686445
Sep	1975	410	20.5189138320754
Oct	1975	386	20.5164795084508
Nov	1975	281	20.5761204372544
Dec	1975	284	20.5262168029493
Jan	1976	303	20.3022590294826
Feb	1976	303	20.7586947091023
Mar	1976	288	20.7306999874189
Apr	1976	279	21.4037904696314
May	1976	281	21.8322314275677
Jun	1976	271	21.9259528871163
Jul	1976	281	20.6406300133073
Aug	1976	279	20.7039224275479
Sep	1976	284	21.2017416087864
Oct	1976	295	21.2175647123466
Nov	1976	287	21.7178182172097
Dec	1976	263	21.6021878450394
Jan	1977	271	22.1133958062134
Feb	1977	297	21.8821350618728
Mar	1977	316	21.8456202075032
Apr	1977	348	21.7944994113858
May	1977	346	21.4889917964937
Jun	1977	372	21.8650947965003
Jul	1977	402	22.0221086702895
Aug	1977	381	22.5442710877744
Sep	1977	389	22.6513813272585
Oct	1977	389	23.233184673547
Nov	1977	346	23.1102513305028
Dec	1977	340	22.9118539550948
Jan	1978	356	22.9568889421506
Feb	1978	356	22.7621430521795
Mar	1978	383	23.2611793952303
Apr	1978	394	23.6445853661108
May	1978	367	24.4162659551212
Jun	1978	351	25.8208706865374
Jul	1978	348	26.9163163176246
Aug	1978	346	27.4421302205464
Sep	1978	372	27.4956853402885
Oct	1978	372	27.8839599584183
Nov	1978	367	27.0453354697304
Dec	1978	354	27.0538556024167
Jan	1979	372	27.3897922626167
Feb	1979	389	27.4969025021008
Mar	1979	426	27.0733301914138
Apr	1979	472	27.3557117318718
May	1979	490	28.8418663047134
Jun	1979	581	28.9027243953294
Jul	1979	624	29.4565330199346
Aug	1979	603	29.8654993888738

Figure 2.A.2

E	F	G
Real Price	Moving Avg	Ratio
=C5/D5*$D$378		
=C6/D6*$D$378		
=C7/D7*$D$378		
=C8/D8*$D$378		
=C9/D9*$D$378		
=C10/D10*$D$378		
=C11/D11*$D$378	=AVERAGE(E5:E16)	=E11/F11
=C12/D12*$D$378	=AVERAGE(E6:E17)	=E12/F12
=C13/D13*$D$378	=AVERAGE(E7:E18)	=E13/F13
=C14/D14*$D$378	=AVERAGE(E8:E19)	=E14/F14
=C15/D15*$D$378	=AVERAGE(E9:E20)	=E15/F15
=C16/D16*$D$378	=AVERAGE(E10:E21)	=E16/F16
=C17/D17*$D$378	=AVERAGE(E11:E22)	=E17/F17
=C18/D18*$D$378	=AVERAGE(E12:E23)	=E18/F18
=C19/D19*$D$378	=AVERAGE(E13:E24)	=E19/F19
=C20/D20*$D$378	=AVERAGE(E14:E25)	=E20/F20
=C21/D21*$D$378	=AVERAGE(E15:E26)	=E21/F21
=C22/D22*$D$378	=AVERAGE(E16:E27)	=E22/F22
=C23/D23*$D$378	=AVERAGE(E17:E28)	=E23/F23
=C24/D24*$D$378	=AVERAGE(E18:E29)	=E24/F24
=C25/D25*$D$378	=AVERAGE(E19:E30)	=E25/F25
=C26/D26*$D$378	=AVERAGE(E20:E31)	=E26/F26
=C27/D27*$D$378	=AVERAGE(E21:E32)	=E27/F27
=C28/D28*$D$378	=AVERAGE(E22:E33)	=E28/F28
=C29/D29*$D$378	=AVERAGE(E23:E34)	=E29/F29
=C30/D30*$D$378	=AVERAGE(E24:E35)	=E30/F30
=C31/D31*$D$378	=AVERAGE(E25:E36)	=E31/F31
=C32/D32*$D$378	=AVERAGE(E26:E37)	=E32/F32
=C33/D33*$D$378	=AVERAGE(E27:E38)	=E33/F33
=C34/D34*$D$378	=AVERAGE(E28:E39)	=E34/F34
=C35/D35*$D$378	=AVERAGE(E29:E40)	=E35/F35
=C36/D36*$D$378	=AVERAGE(E30:E41)	=E36/F36
=C37/D37*$D$378	=AVERAGE(E31:E42)	=E37/F37
=C38/D38*$D$378	=AVERAGE(E32:E43)	=E38/F38
=C39/D39*$D$378	=AVERAGE(E33:E44)	=E39/F39
=C40/D40*$D$378	=AVERAGE(E34:E45)	=E40/F40
=C41/D41*$D$378	=AVERAGE(E35:E46)	=E41/F41
=C42/D42*$D$378	=AVERAGE(E36:E47)	=E42/F42
=C43/D43*$D$378	=AVERAGE(E37:E48)	=E43/F43
=C44/D44*$D$378	=AVERAGE(E38:E49)	=E44/F44
=C45/D45*$D$378	=AVERAGE(E39:E50)	=E45/F45
=C46/D46*$D$378	=AVERAGE(E40:E51)	=E46/F46
=C47/D47*$D$378	=AVERAGE(E41:E52)	=E47/F47
=C48/D48*$D$378	=AVERAGE(E42:E53)	=E48/F48
=C49/D49*$D$378	=AVERAGE(E43:E54)	=E49/F49
=C50/D50*$D$378	=AVERAGE(E44:E55)	=E50/F50
=C51/D51*$D$378	=AVERAGE(E45:E56)	=E51/F51
=C52/D52*$D$378	=AVERAGE(E46:E57)	=E52/F52
=C53/D53*$D$378	=AVERAGE(E47:E58)	=E53/F53
=C54/D54*$D$378	=AVERAGE(E48:E59)	=E54/F54

Figure 2.B.1

A	B	C	D
Month	Year	Price Tk/quintal	CPI
January	2003	1395	136.75
February	2003	1391	137.15
March	2003	1400	137.27
April	2003	1393	137.53
May	2003	1260	138.42
June	2003	1273	138.84
July	2003	1210	139.58
August	2003	1290	140.71
September	2003	1345	141.71
October	2003	1308	142.72
November	2003	1302	143.71
December	2003	1299	144.45
January	2004	1334	144.9
February	2004	1356	145.07
March	2004	1361	145.43
April	2004	1308	145.69
May	2004	1307	146.2
June	2004	1262	146.67
July	2004	1277	147.46
August	2004	1350	148.47
September	2004	1360	152.12
October	2004	1470	154.03
November	2004	1449	152.85
December	2004	1523	152.4
January	2005	1585	152.9
February	2005	1628	154.32
March	2005	1588	155.2
April	2005	1561	155.33
May	2005	1423	156.29
June	2005	1469	157.45
July	2005	1557	158.79
August	2005	1549	160.25
September	2005	1544	162.79
October	2005	1547	165.24
November	2005	1579	165
December	2005	1590	163.17
January	2006	1594	162.97
February	2006	1611	163.14
March	2006	1605	164.78
April	2006	1607	166.91
May	2006	1582	168.19
June	2006	1593	169.32
July	2006	1561	169.54
August	2006	1584	170.94
September	2006	1587	
October	2006	1602	
November	2006		
December	2006		
January	2007		

Figure 2.B.2

A	B	E	F
Month	Year	Real Price	Moving Avg
January	2003	=C335/D335*$D$378	=AVERAGE(E329:E340)
February	2003	=C336/D336*$D$378	=AVERAGE(E330:E341)
March	2003	=C337/D337*$D$378	=AVERAGE(E331:E342)
April	2003	=C338/D338*$D$378	=AVERAGE(E332:E343)
May	2003	=C339/D339*$D$378	=AVERAGE(E333:E344)
June	2003	=C340/D340*$D$378	=AVERAGE(E334:E345)
July	2003	=C341/D341*$D$378	=AVERAGE(E335:E346)
August	2003	=C342/D342*$D$378	=AVERAGE(E336:E347)
September	2003	=C343/D343*$D$378	=AVERAGE(E337:E348)
October	2003	=C344/D344*$D$378	=AVERAGE(E338:E349)
November	2003	=C345/D345*$D$378	=AVERAGE(E339:E350)
December	2003	=C346/D346*$D$378	=AVERAGE(E340:E351)
January	2004	=C347/D347*$D$378	=AVERAGE(E341:E352)
February	2004	=C348/D348*$D$378	=AVERAGE(E342:E353)
March	2004	=C349/D349*$D$378	=AVERAGE(E343:E354)
April	2004	=C350/D350*$D$378	=AVERAGE(E344:E355)
May	2004	=C351/D351*$D$378	=AVERAGE(E345:E356)
June	2004	=C352/D352*$D$378	=AVERAGE(E346:E357)
July	2004	=C353/D353*$D$378	=AVERAGE(E347:E358)
August	2004	=C354/D354*$D$378	=AVERAGE(E348:E359)
September	2004	=C355/D355*$D$378	=AVERAGE(E349:E360)
October	2004	=C356/D356*$D$378	=AVERAGE(E350:E361)
November	2004	=C357/D357*$D$378	=AVERAGE(E351:E362)
December	2004	=C358/D358*$D$378	=AVERAGE(E352:E363)
January	2005	=C359/D359*$D$378	=AVERAGE(E353:E364)
February	2005	=C360/D360*$D$378	=AVERAGE(E354:E365)
March	2005	=C361/D361*$D$378	=AVERAGE(E355:E366)
April	2005	=C362/D362*$D$378	=AVERAGE(E356:E367)
May	2005	=C363/D363*$D$378	=AVERAGE(E357:E368)
June	2005	=C364/D364*$D$378	=AVERAGE(E358:E369)
July	2005	=C365/D365*$D$378	=AVERAGE(E359:E370)
August	2005	=C366/D366*$D$378	=AVERAGE(E360:E371)
September	2005	=C367/D367*$D$378	=AVERAGE(E361:E372)
October	2005	=C368/D368*$D$378	=AVERAGE(E362:E373)
November	2005	=C369/D369*$D$378	=AVERAGE(E363:E374)
December	2005	=C370/D370*$D$378	=AVERAGE(E364:E375)
January	2006	=C371/D371*$D$378	=AVERAGE(E365:E376)
February	2006	=C372/D372*$D$378	=AVERAGE(E366:E377)
March	2006	=C373/D373*$D$378	=AVERAGE(E367:E378)
April	2006	=C374/D374*$D$378	
May	2006	=C375/D375*$D$378	
June	2006	=C376/D376*$D$378	
July	2006	=C377/D377*$D$378	
August	2006	=C378/D378*$D$378	
September	2006		
October	2006		
November	2006		
December	2006		
January	2007		

Figure 2.B.3

A	B	G
Month	Year	Ratio
January	2003	=E335/F335
February	2003	=E336/F336
March	2003	=E337/F337
April	2003	=E338/F338
May	2003	=E339/F339
June	2003	=E340/F340
July	2003	=E341/F341
August	2003	=E342/F342
September	2003	=E343/F343
October	2003	=E344/F344
November	2003	=E345/F345
December	2003	=E346/F346
January	2004	=E347/F347
February	2004	=E348/F348
March	2004	=E349/F349
April	2004	=E350/F350
May	2004	=E351/F351
June	2004	=E352/F352
July	2004	=E353/F353
August	2004	=E354/F354
September	2004	=E355/F355
October	2004	=E356/F356
November	2004	=E357/F357
December	2004	=E358/F358
January	2005	=E359/F359
February	2005	=E360/F360
March	2005	=E361/F361
April	2005	=E362/F362
May	2005	=E363/F363
June	2005	=E364/F364
July	2005	=E365/F365
August	2005	=E366/F366
September	2005	=E367/F367
October	2005	=E368/F368
November	2005	=E369/F369
December	2005	=E370/F370
January	2006	=E371/F371
February	2006	=E372/F372
March	2006	=E373/F373
April	2006	
May	2006	
June	2006	
July	2006	
August	2006	
September	2006	
October	2006	
November	2006	
December	2006	
January	2007	

Figure 2.B.4

A	B	H
Month	Year	SeasFact
January	2003	=(G263+G275+G287+G299+G311+G323+G335)/7
February	2003	=(G264+G276+G288+G300+G312+G324+G336)/7
March	2003	=(G265+G277+G289+G301+G313+G325+G337)/7
April	2003	=(G266+G278+G290+G302+G314+G326+G338)/7
May	2003	=(G267+G279+G291+G303+G315+G327+G339)/7
June	2003	=(G268+G280+G292+G304+G316+G328+G340)/7
July	2003	=(G269+G281+G293+G305+G317+G329+G341)/7
August	2003	=(G270+G282+G294+G306+G318+G330+G342)/7
September	2003	=(G271+G283+G295+G307+G319+G331+G343)/7
October	2003	=(G272+G284+G296+G308+G320+G332+G344)/7
November	2003	=(G273+G285+G297+G309+G321+G333+G345)/7
December	2003	=(G274+G286+G298+G310+G322+G334+G346)/7
January	2004	=(G275+G287+G299+G311+G323+G335+G347)/7
February	2004	=(G276+G288+G300+G312+G324+G336+G348)/7
March	2004	=(G277+G289+G301+G313+G325+G337+G349)/7
April	2004	=(G278+G290+G302+G314+G326+G338+G350)/7
May	2004	=(G279+G291+G303+G315+G327+G339+G351)/7
June	2004	=(G280+G292+G304+G316+G328+G340+G352)/7
July	2004	=(G281+G293+G305+G317+G329+G341+G353)/7
August	2004	=(G282+G294+G306+G318+G330+G342+G354)/7
September	2004	=(G283+G295+G307+G319+G331+G343+G355)/7
October	2004	=(G284+G296+G308+G320+G332+G344+G356)/7
November	2004	=(G285+G297+G309+G321+G333+G345+G357)/7
December	2004	=(G286+G298+G310+G322+G334+G346+G358)/7
January	2005	=(G287+G299+G311+G323+G335+G347+G359)/7
February	2005	=(G288+G300+G312+G324+G336+G348+G360)/7
March	2005	=(G289+G301+G313+G325+G337+G349+G361)/7
April	2005	=(G290+G302+G314+G326+G338+G350+G362)/7
May	2005	=(G291+G303+G315+G327+G339+G351+G363)/7
June	2005	=(G292+G304+G316+G328+G340+G352+G364)/7
July	2005	=(G293+G305+G317+G329+G341+G353+G365)/7
August	2005	=(G294+G306+G318+G330+G342+G354+G366)/7
September	2005	=(G295+G307+G319+G331+G343+G355+G367)/7
October	2005	=(G296+G308+G320+G332+G344+G356+G368)/7
November	2005	=(G297+G309+G321+G333+G345+G357+G369)/7
December	2005	=(G298+G310+G322+G334+G346+G358+G370)/7
January	2006	=(G299+G311+G323+G335+G347+G359+G371)/7
February	2006	=(G300+G312+G324+G336+G348+G360+G372)/7
March	2006	=(G301+G313+G325+G337+G349+G361+G373)/7
April	2006	
May	2006	
June	2006	
July	2006	
August	2006	
September	2006	
October	2006	
November	2006	
December	2006	
January	2007	

Figure 2.B.5

A	B	I	J
Month	Year	Sum	SeasFact Normalized
January	2003	=SUM(H324:H335)	
February	2003	=SUM(H325:H336)	
March	2003	=SUM(H326:H337)	
April	2003	=SUM(H327:H338)	
May	2003	=SUM(H328:H339)	
June	2003	=SUM(H329:H340)	
July	2003	=SUM(H330:H341)	
August	2003	=SUM(H331:H342)	
September	2003	=SUM(H332:H343)	
October	2003	=SUM(H333:H344)	
November	2003	=SUM(H334:H345)	
December	2003	=SUM(H335:H346)	
January	2004	=SUM(H336:H347)	
February	2004	=SUM(H337:H348)	
March	2004	=SUM(H338:H349)	
April	2004	=SUM(H339:H350)	
May	2004	=SUM(H340:H351)	
June	2004	=SUM(H341:H352)	
July	2004	=SUM(H342:H353)	
August	2004	=SUM(H343:H354)	
September	2004	=SUM(H344:H355)	
October	2004	=SUM(H345:H356)	
November	2004	=SUM(H346:H357)	
December	2004	=SUM(H347:H358)	
January	2005	=SUM(H348:H359)	
February	2005	=SUM(H349:H360)	
March	2005	=SUM(H350:H361)	
April	2005	=SUM(H351:H362)	=H362*12/$I$373
May	2005	=SUM(H352:H363)	=H363*12/$I$373
June	2005	=SUM(H353:H364)	=H364*12/$I$373
July	2005	=SUM(H354:H365)	=H365*12/$I$373
August	2005	=SUM(H355:H366)	=H366*12/$I$373
September	2005	=SUM(H356:H367)	=H367*12/$I$373
October	2005	=SUM(H357:H368)	=H368*12/$I$373
November	2005	=SUM(H358:H369)	=H369*12/$I$373
December	2005	=SUM(H359:H370)	=H370*12/$I$373
January	2006	=SUM(H360:H371)	=H371*12/$I$373
February	2006	=SUM(H361:H372)	=H372*12/$I$373
March	2006	=SUM(H362:H373)	=H373*12/$I$373
April	2006		
May	2006		
June	2006		
July	2006		
August	2006		
September	2006		
October	2006		
November	2006		
December	2006		
January	2007		

Figure 2.B.6

A	B	L
Month	Year	Actual Past Price
January	2003	
February	2003	
March	2003	
April	2003	
May	2003	
June	2003	
July	2003	
August	2003	
September	2003	
October	2003	
November	2003	
December	2003	
January	2004	
February	2004	
March	2004	
April	2004	
May	2004	
June	2004	
July	2004	
August	2004	
September	2004	
October	2004	
November	2004	
December	2004	
January	2005	
February	2005	
March	2005	
April	2005	
May	2005	
June	2005	
July	2005	
August	2005	
September	2005	
October	2005	
November	2005	
December	2005	
January	2006	
February	2006	
March	2006	
April	2006	
May	2006	
June	2006	=C376
July	2006	=C377
August	2006	=C378
September	2006	=C379
October	2006	=C380
November	2006	
December	2006	
January	2007	

Figure 2.B.7

A	B	M
Month	Year	"Normal" Past Price
January	2003	
February	2003	
March	2003	
April	2003	
May	2003	
June	2003	
July	2003	
August	2003	
September	2003	
October	2003	
November	2003	
December	2003	
January	2004	
February	2004	
March	2004	
April	2004	
May	2004	
June	2004	
July	2004	
August	2004	
September	2004	
October	2004	
November	2004	
December	2004	
January	2005	
February	2005	
March	2005	
April	2005	
May	2005	
June	2005	
July	2005	
August	2005	
September	2005	
October	2005	
November	2005	
December	2005	
January	2006	
February	2006	
March	2006	
April	2006	
May	2006	
June	2006	=AVERAGE($E$331:$E$378)*D376/$D$378*J364
July	2006	=AVERAGE($E$331:$E$378)*D377/$D$378*J365
August	2006	=AVERAGE($E$331:$E$378)*D378/$D$378*J366
September	2006	=AVERAGE($E$331:$E$378)*(D378/D366)^(1/12)*J367
October	2006	=AVERAGE($E$331:$E$378)*(D378/D366)^(1/6)*J368
November	2006	
December	2006	
January	2007	

Figure 2.B.8

A	B	N
Month	Year	Future Price Low Benchmark
January	2003	
February	2003	
March	2003	
April	2003	
May	2003	
June	2003	
July	2003	
August	2003	
September	2003	
October	2003	
November	2003	
December	2003	
January	2004	
February	2004	
March	2004	
April	2004	
May	2004	
June	2004	
July	2004	
August	2004	
September	2004	
October	2004	
November	2004	
December	2004	
January	2005	
February	2005	
March	2005	
April	2005	
May	2005	
June	2005	
July	2005	
August	2005	
September	2005	
October	2005	
November	2005	
December	2005	
January	2006	
February	2006	
March	2006	
April	2006	
May	2006	
June	2006	
July	2006	
August	2006	
September	2006	
October	2006	
November	2006	=C380*J369/J368*(D378/D366)^(1/12)*0.96
December	2006	=C380*J370/J368*(D378/D366)^(1/6)*0.95
January	2007	=C380*J371/J368*(D378/D366)^(1/4)*0.94

Figure 2.B.9

A	B	C
Month	Year	Future Price Benchmark
January	2003	
February	2003	
March	2003	
April	2003	
May	2003	
June	2003	
July	2003	
August	2003	
September	2003	
October	2003	
November	2003	
December	2003	
January	2004	
February	2004	
March	2004	
April	2004	
May	2004	
June	2004	
July	2004	
August	2004	
September	2004	
October	2004	
November	2004	
December	2004	
January	2005	
February	2005	
March	2005	
April	2005	
May	2005	
June	2005	
July	2005	
August	2005	
September	2005	
October	2005	
November	2005	
December	2005	
January	2006	
February	2006	
March	2006	
April	2006	
May	2006	
June	2006	
July	2006	
August	2006	
September	2006	
October	2006	
November	2006	=C380*J369/J368*(D378/D366)^(1/12)
December	2006	=C380*J370/J368*(D378/D366)^(1/6)
January	2007	=C380*J371/J368*(D378/D366)^(1/4)

Figure 2.B.10

A	B	P
Month	Year	Future Price High Benchmark
January	2003	
February	2003	
March	2003	
April	2003	
May	2003	
June	2003	
July	2003	
August	2003	
September	2003	
October	2003	
November	2003	
December	2003	
January	2004	
February	2004	
March	2004	
April	2004	
May	2004	
June	2004	
July	2004	
August	2004	
September	2004	
October	2004	
November	2004	
December	2004	
January	2005	
February	2005	
March	2005	
April	2005	
May	2005	
June	2005	
July	2005	
August	2005	
September	2005	
October	2005	
November	2005	
December	2005	
January	2006	
February	2006	
March	2006	
April	2006	
May	2006	
June	2006	
July	2006	
August	2006	
September	2006	
October	2006	
November	2006	=C380*J369/J368*(D378/D366)^(1/12)*1.04
December	2006	=C380*J370/J368*(D378/D366)^(1/6)*1.05
January	2007	=C380*J371/J368*(D378/D366)^(1/4)*1.06

Figure 3. Wholesale coarse rice price trends and benchmarks in Bangladesh, 2006

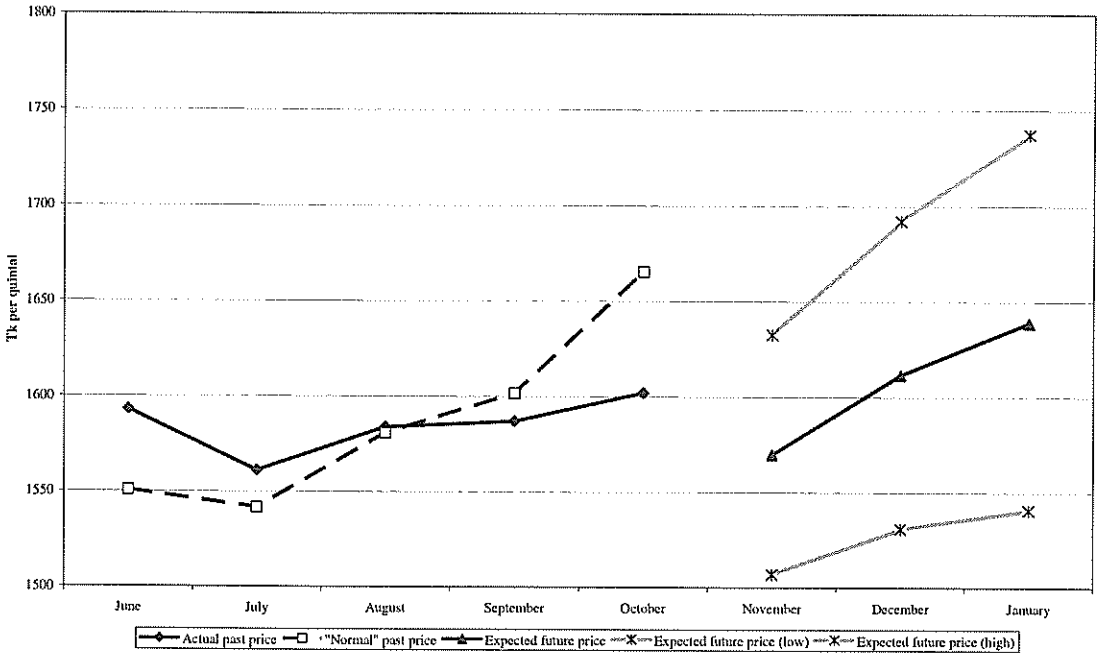

Figure 4. Wholesale coarse rice price trends and benchmarks in Bangladesh, 1992