Seasonal Products

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Introduction

The seasonal product price indexes discussed in the various sections of this paper are different depending on the following differences that characterize the method used to deal with the seasonality problem and the availability of data:

- **Price and quantity (or expenditure) data are available versus only price information is available.**
- **Carry forward prices are used as imputations for missing prices versus methods that do not use imputations.**
- **A year over year index for the same month is constructed versus a month to month index is constructed. Annual indexes that measure all prices in one year relative to another year provide another source of difference.**
- **A traditional fixed base or chained bilateral Laspeyres, Paasche, Fisher or Törnqvist index are constructed versus the use of a multilateral index.**
- **The index uses monthly weights or it uses annual weights.**

The above list of differences indicates that a single price index for a group of seasonal commodities is unlikely to meet all user needs.

The various index concepts will be illustrated using monthly data from Israel for 14 fruit groups for the 6 years 2012-2017 (72 monthly observations).

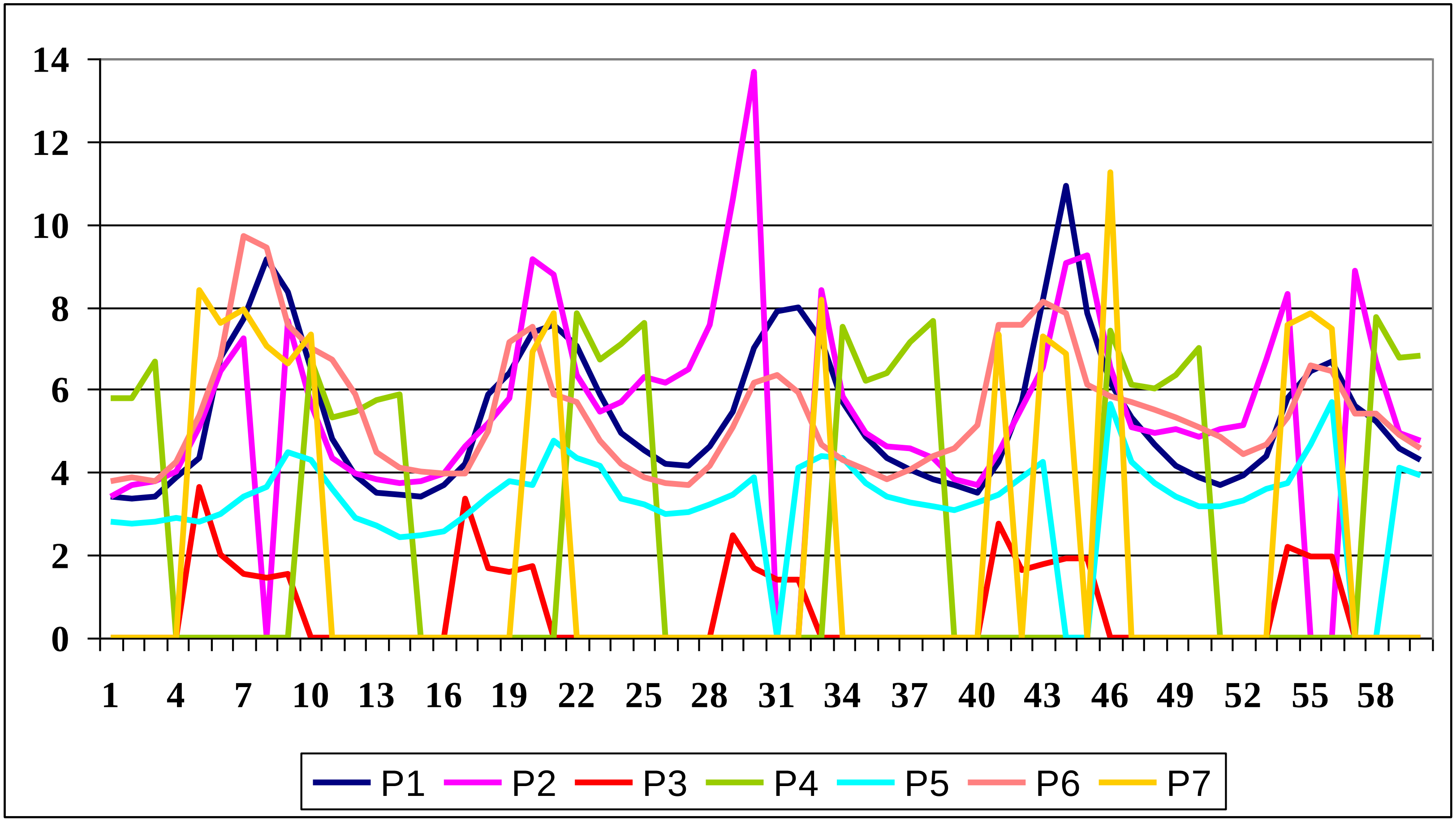
The Data

The 14 fresh fruit categories are the following ones:

- **1 = Lemons**
- **2 = Avocados**
- **3 = Watermelon (Big seller when in season)**
- **4 = Persimmon**
- **5 = Grapefruit**
- **6 = Bananas (Big seller all year around)**
- **7 = Peaches**
- **8 = Strawberries**
- **9 = Cherries**
- **10 = Apricots**
- **11 = Plums**
- **12 = Clementines (Big seller when in season)**
- **13 = Kiwi fruit**
- **14 = Mangos.**

Fruits 1 and 6 were present in all months. There were 72x12 = 1008 possible price and quantity observations but there were 451 missing prices! The following 4 slides plot all of the prices and quantities.

The Data (2)



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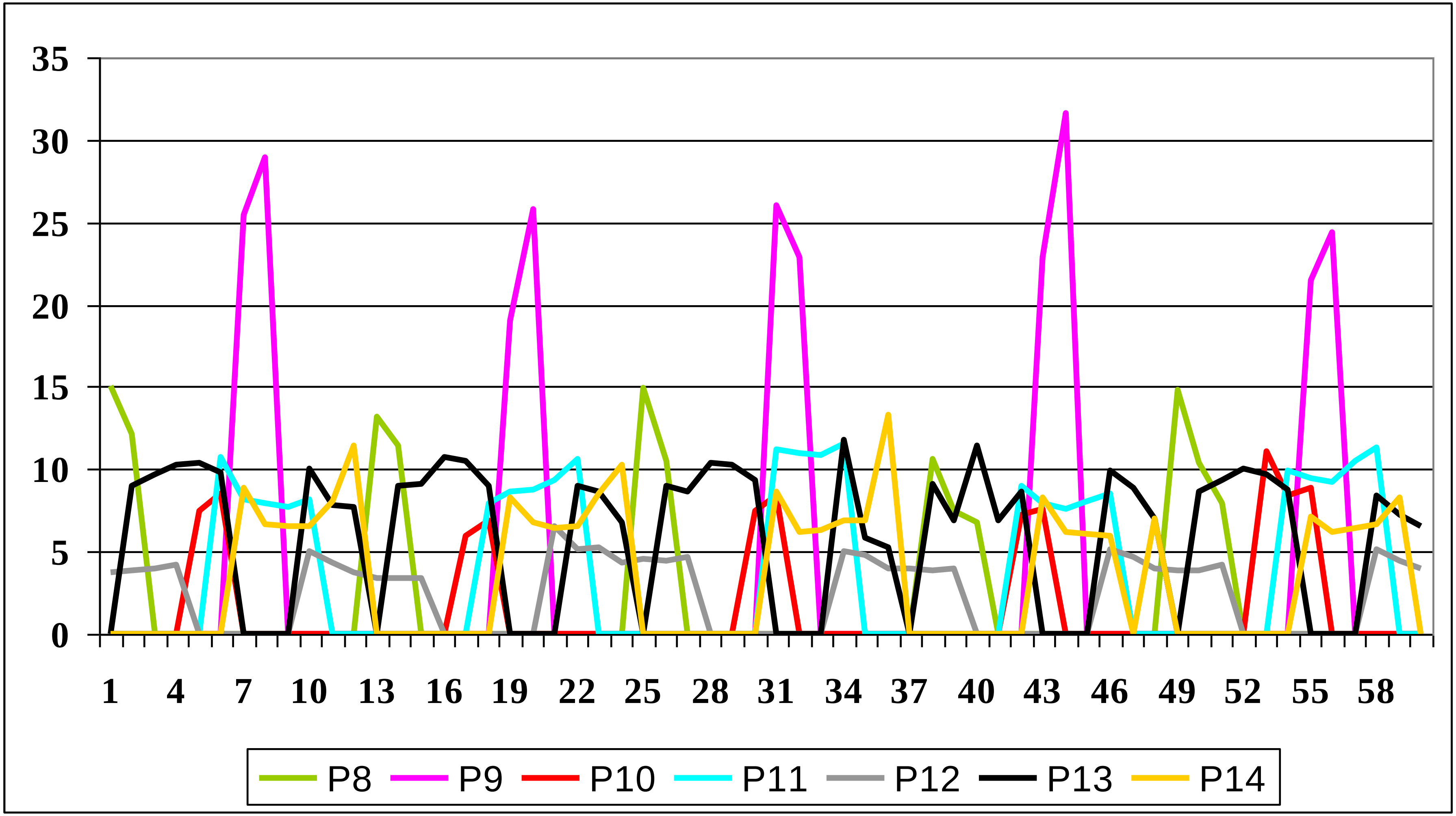
P6
P7

The Data (3)



35
30
25
20
15
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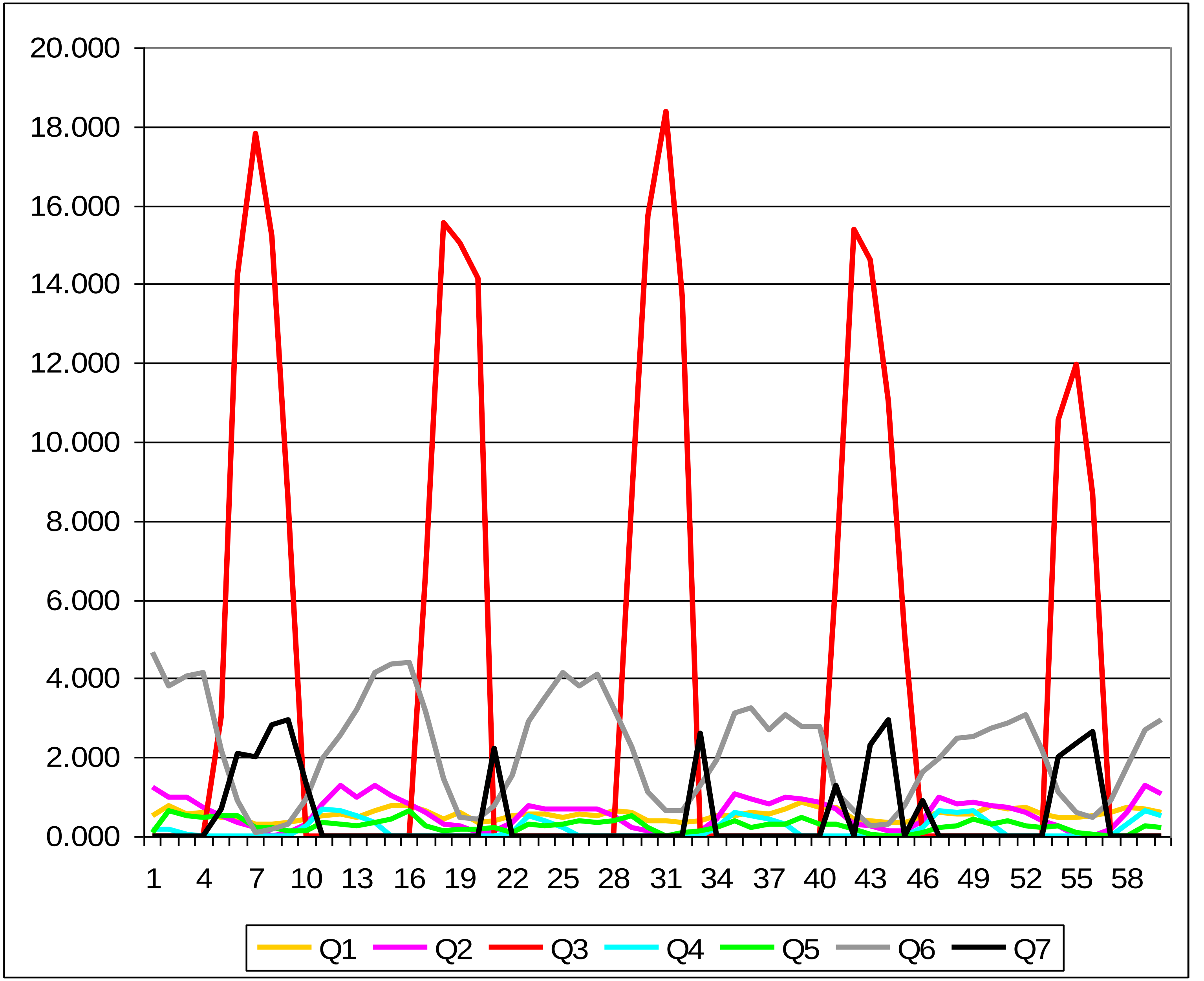
5
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58
P8 P9 P10 P11 P12 P13 P14

The Data (4)



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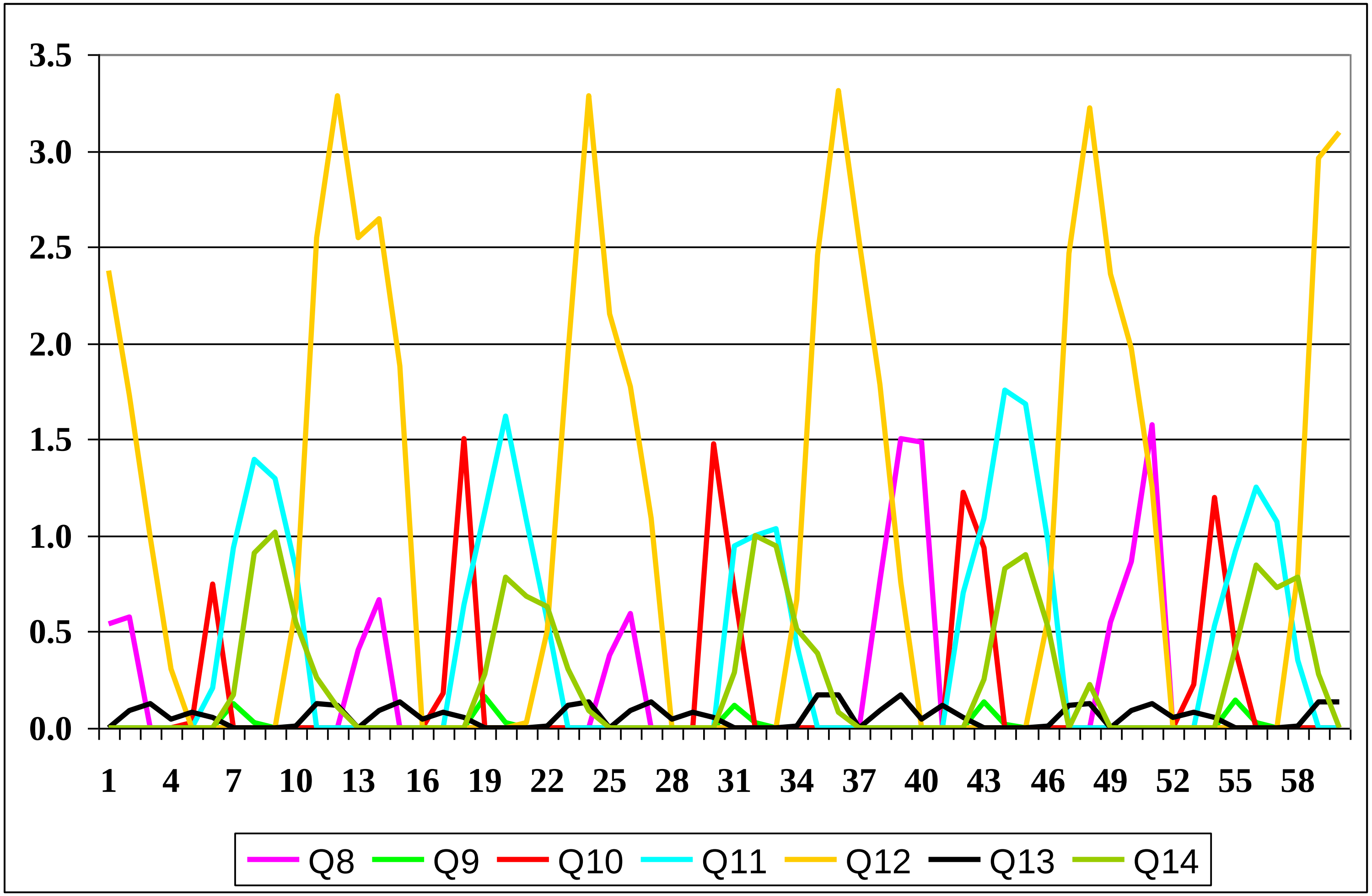
Q1 Q2 Q3 Q4 Q5 Q6 Q7

The Data (5)



3.5
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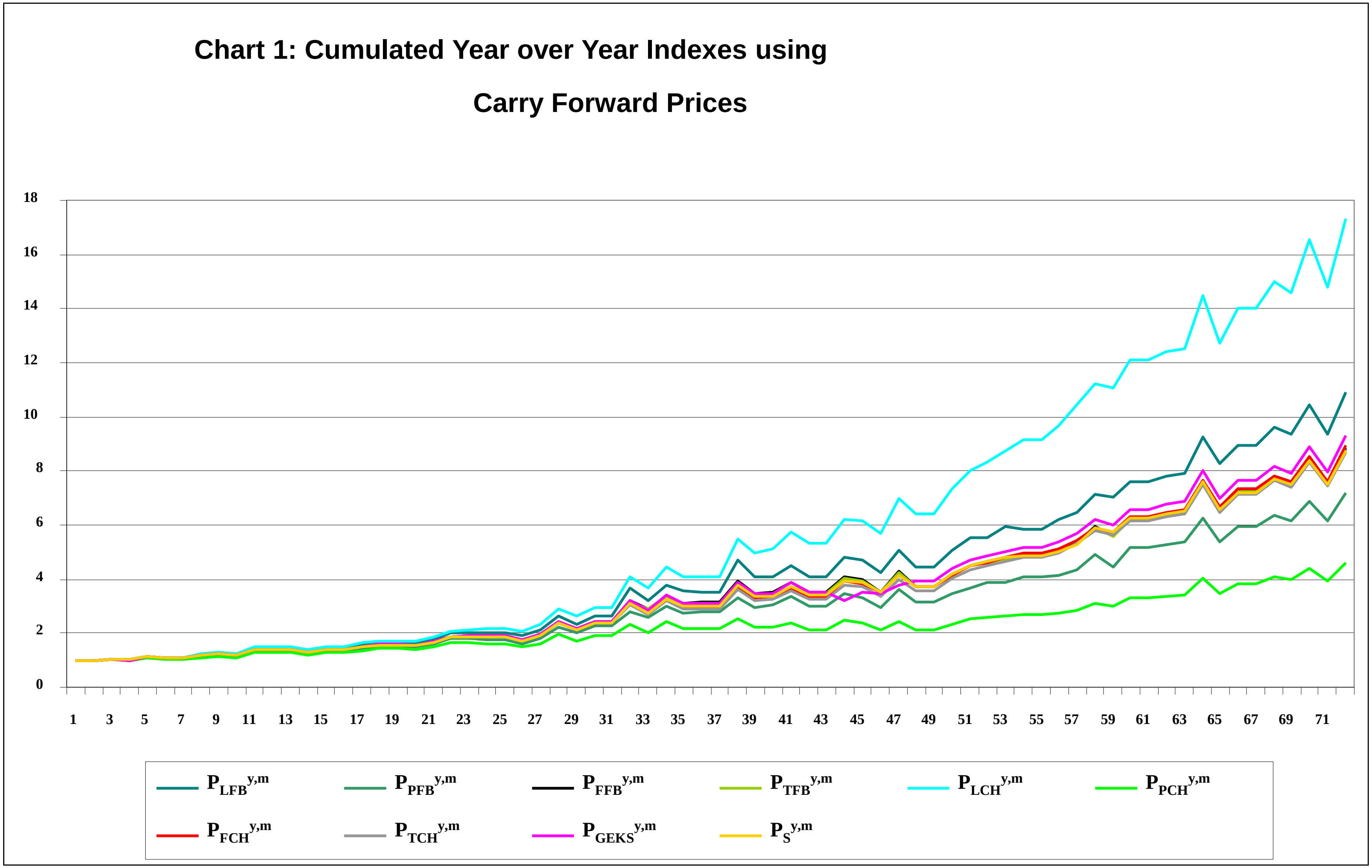
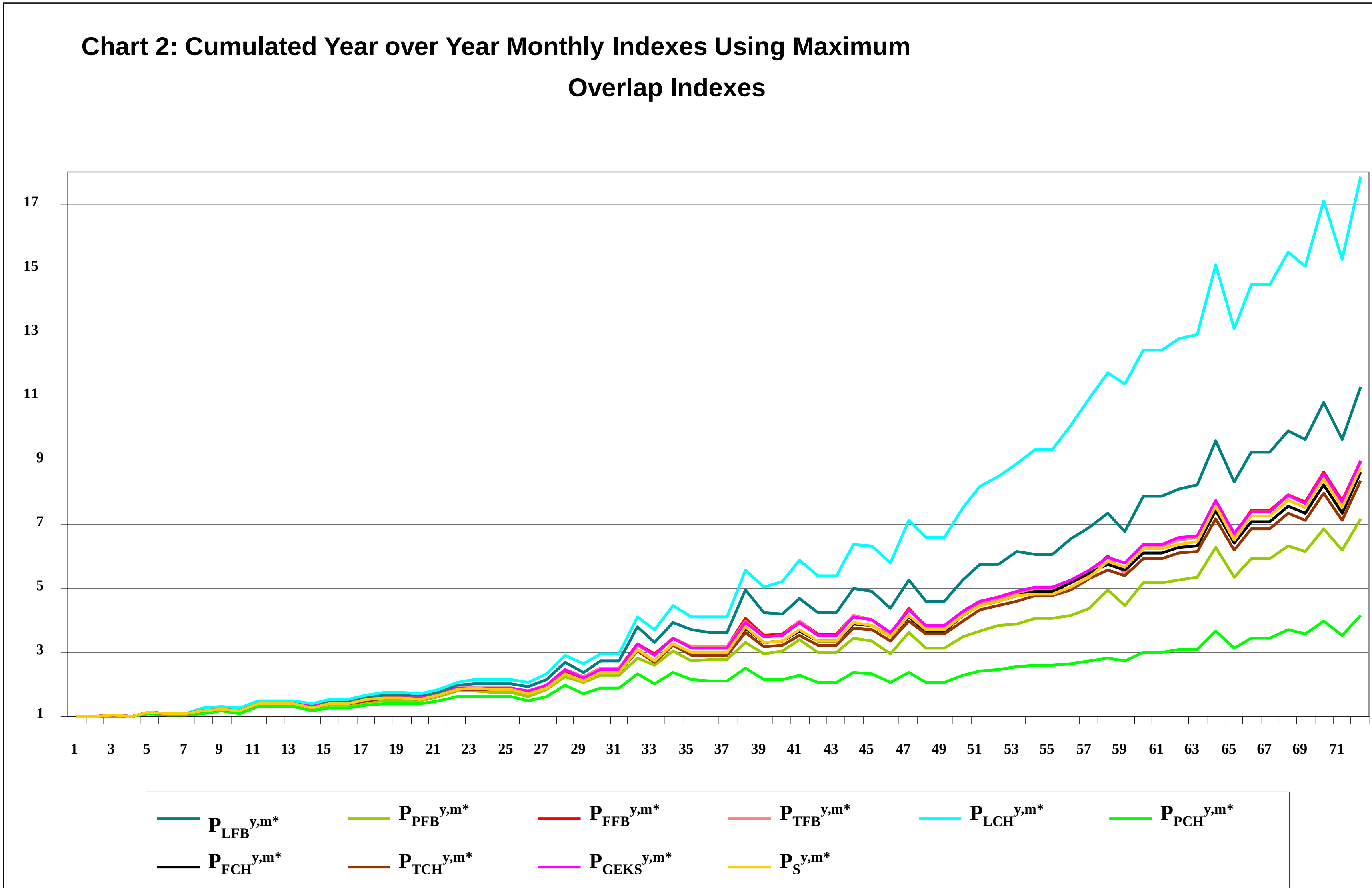
2. Year over Year Monthly Indexes using Carry Forward Prices



2. Year over Year Monthly Indexes using Carry Forward Prices 2

- **The highest series is the cumulated chained Laspeyres index P_{LCH} followed by the cumulated fixed base Laspeyres index, P_{LFB}.**
- **The lowest series is the cumulated chained Paasche index P_{PCH} followed by the cumulated fixed base Paasche index, P_{PFB}.**
- **The remaining 6 indexes are all clustered together in the middle of these outlier series, with the cumulated GEKS indexes P_{GEKS} lying slightly above the remaining 5 clustered indexes. The cumulated chained Törnqvist Theil indexes P_{TCH} are just a bit below the other 4 clustered indexes.**
- **The above series used carry forward or carry backward prices for seasonal products which were at times not available in their "regular" seasonally available months.**
- **However, when there is general inflation (or deflation) in an economy, there is a risk of introducing a significant amount of bias when carry forward prices are used to fill in for the missing prices. Hence in the following section, we will calculate year over year indexes without using carry forward prices.**
- **Note that the 6 clustered indexes are all superlative indexes.**

3. Maximum Overlap Year over Year Monthly Indexes



3. Maximum Overlap Year over Year Monthly Indexes (2)

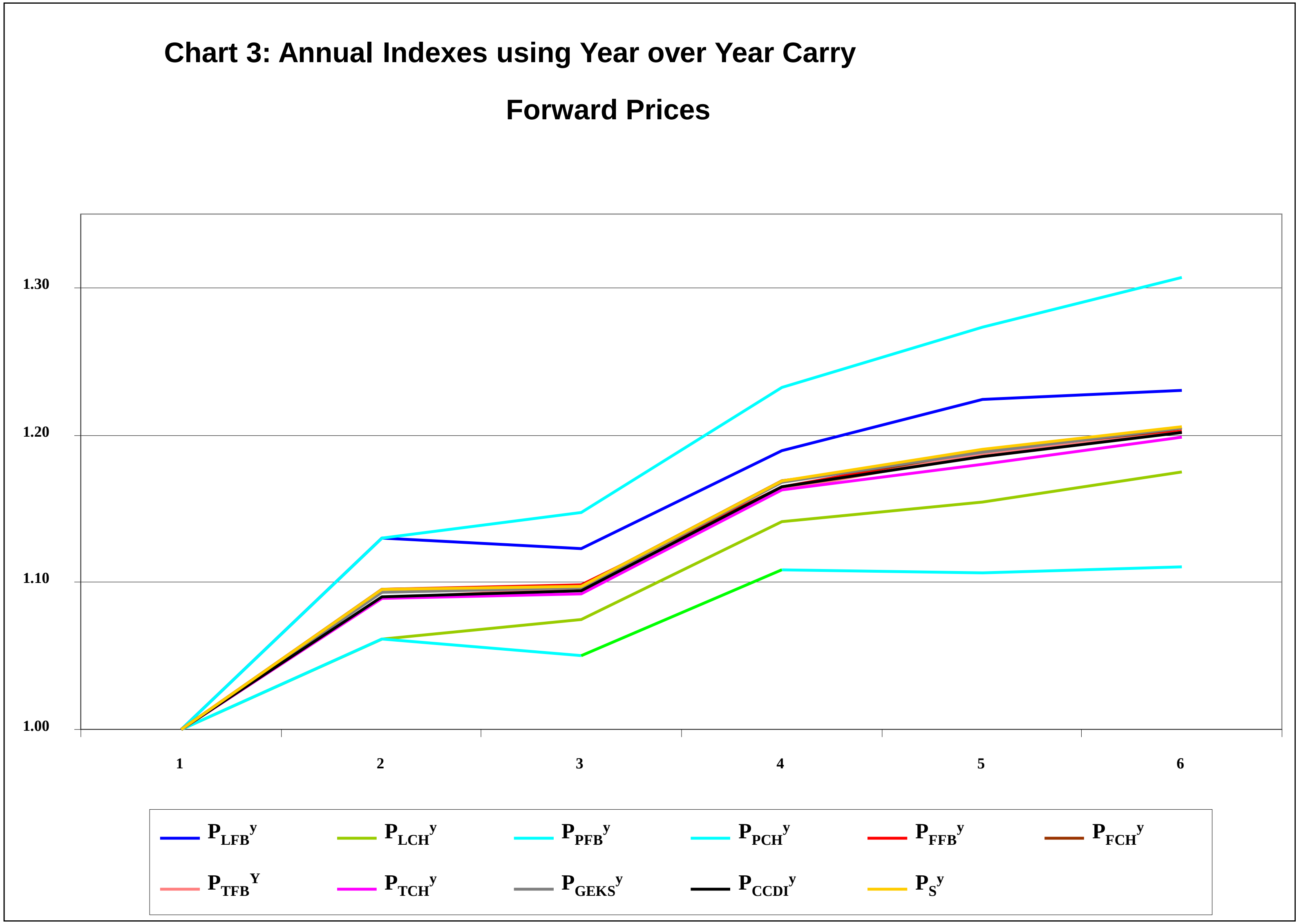
Our conclusions regarding the use of year over year monthly indexes are:

- **The use of the Laspeyres and Paasche indexes should be avoided. The fixed base and chained Laspeyres indexes tend to lie well above the clustered superlative indexes while the fixed base and chained Paasche indexes tend to lie well below the clustered superlative indexes.**
- **The chained Fisher and Törnqvist Theil indexes may suffer from a small amount of chain drift.**
- **The fixed base Fisher, Törnqvist Theil, GEKS and Predicted Share Similarity linked indexes are all fairly close to each other in the present context where we are measuring year over year inflation for each month in the year.**
- **The use of carry forward prices will tend to lead to indexes which are biased downward if there is general inflation and so in order to avoid this potential bias, it is best to use the indexes that use maximum overlap superlative bilateral indexes as their basic building blocks. Thus the maximum overlap fixed base Fisher and fixed base Törnqvist Theil, the GEKS and the Predicted Share similarity linked indexes, $P_{FFB}^{y,m*}$, $P_{TFB}^{y,m*}$, $P_{GEKS}^{y,m*}$ and $P_{S}^{y,m*}$, emerge as our "best" choices for year over year monthly indexes.**

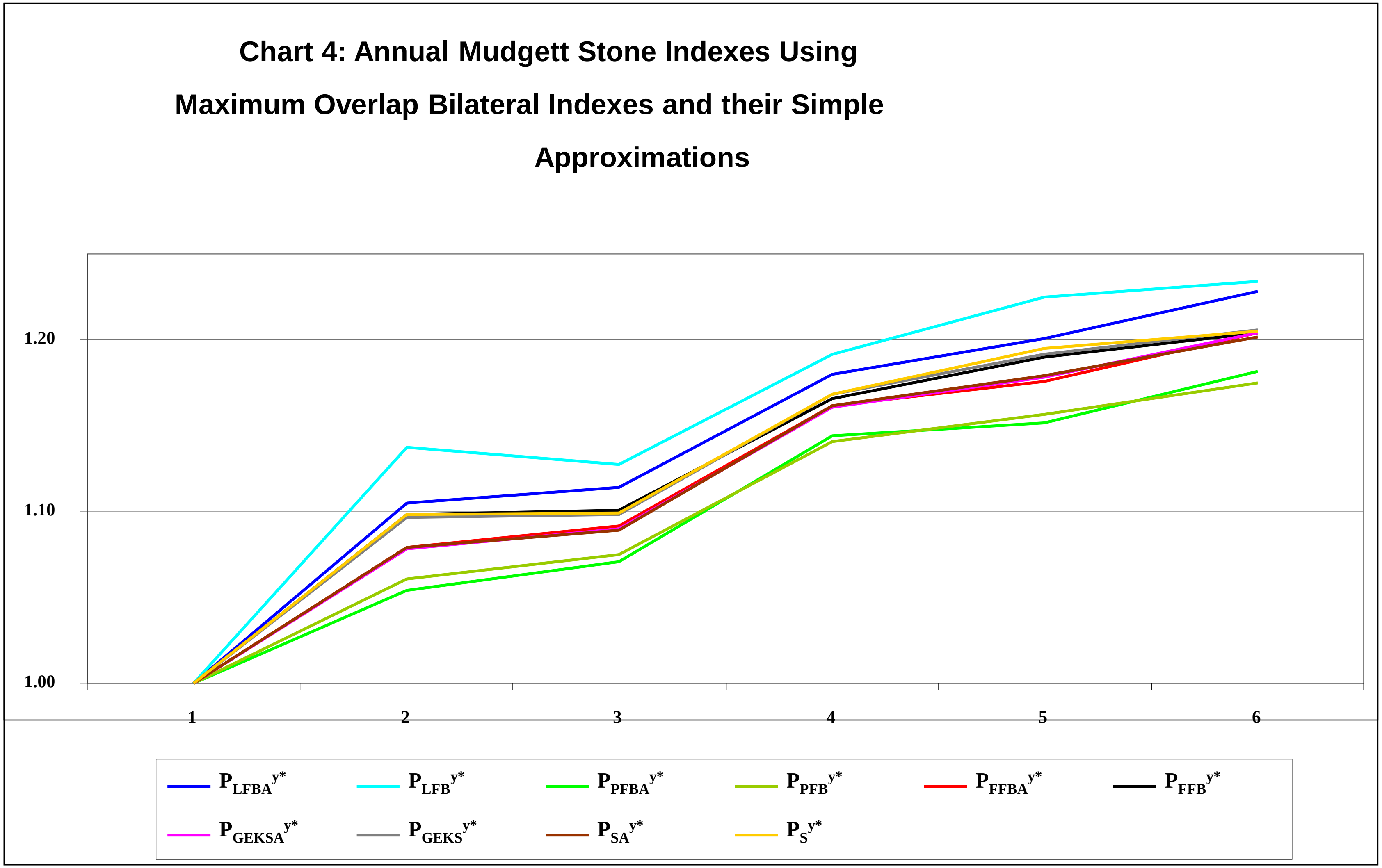
4. The Construction of Annual Indexes using Carry Forward Prices

- **Assuming that each commodity in each season of the year is a separate "annual" commodity is the simplest and theoretically most satisfactory method for dealing with seasonal commodities when the goal is to construct annual price and quantity indexes.**
- **This idea can be traced back to Mudgett in the consumer price context and to Stone in the producer price context.**
- ***The annual fixed base Laspeyres price index for year y*, P_{LFB}^{y}, is a year 1 monthly expenditure share weighted *arithmetic* average of the M year over year fixed base Laspeyres monthly indexes for year y.**
- ***The annual fixed base Paasche price index for year y*, P_{PFB}^{y}, is a year y monthly expenditure share weighted *harmonic* average of the 12 fixed base year over year Paasche monthly indexes for year y.**
- **It can be seen that the annual fixed base and chained Laspeyres indexes, P_{LFB}^{y} and P_{LCH}^{y}, lie well above the superlative indexes and the annual fixed base and chained Paasche indexes, P_{PFB}^{y} and P_{PCH}^{y}, lie well below the remaining indexes. The remaining indexes are all tightly clustered together and cannot be easily distinguished on the following chart.**

4. The Construction of Annual Indexes using Carry Forward Prices (2)



5. The Construction of Annual Indexes using Maximum Overlap Bilateral Indexes



5. The Construction of Annual Indexes using Maximum Overlap Bilateral Indexes (2)

- **The new maximum overlap annual fixed base and chained Laspeyres indexes, P_{LFB}^{y*} and P_{LCH}^{y*}, are well above the superlative indexes and the new maximum overlap annual fixed base and chained Paasche indexes, P_{PFB}^{y*} and P_{PCH}^{y*}, are well below the superlative indexes. (Same as before).**
- **Our five best indexes are the fixed base Fisher and Törnqvist Theil indexes and the multilateral GEKS, CCDI and Predicted Share Price Similarity linked indexes. These five indexes ended up at 1.2044, 1.2031, 1.2056, 1.2028 and 1.2053. The average of these five final values is 1.2048. The average of the five final values for the same indexes listed in Table 10 is 1.2032. Thus the differences between our best maximum overlap indexes listed in Table 12 and the counterpart indexes listed in Table 10 that used carry forward prices are not large for our empirical example.**
- **The downward bias resulting from the use of carry forward prices over the sample period is only about 0.16 percentage points over 5 years.**
- **However, this bias is not negligible and can be avoided by using bilateral maximum overlap indexes.**

5. The Construction of Annual Indexes using Maximum Overlap Bilateral Indexes (3)

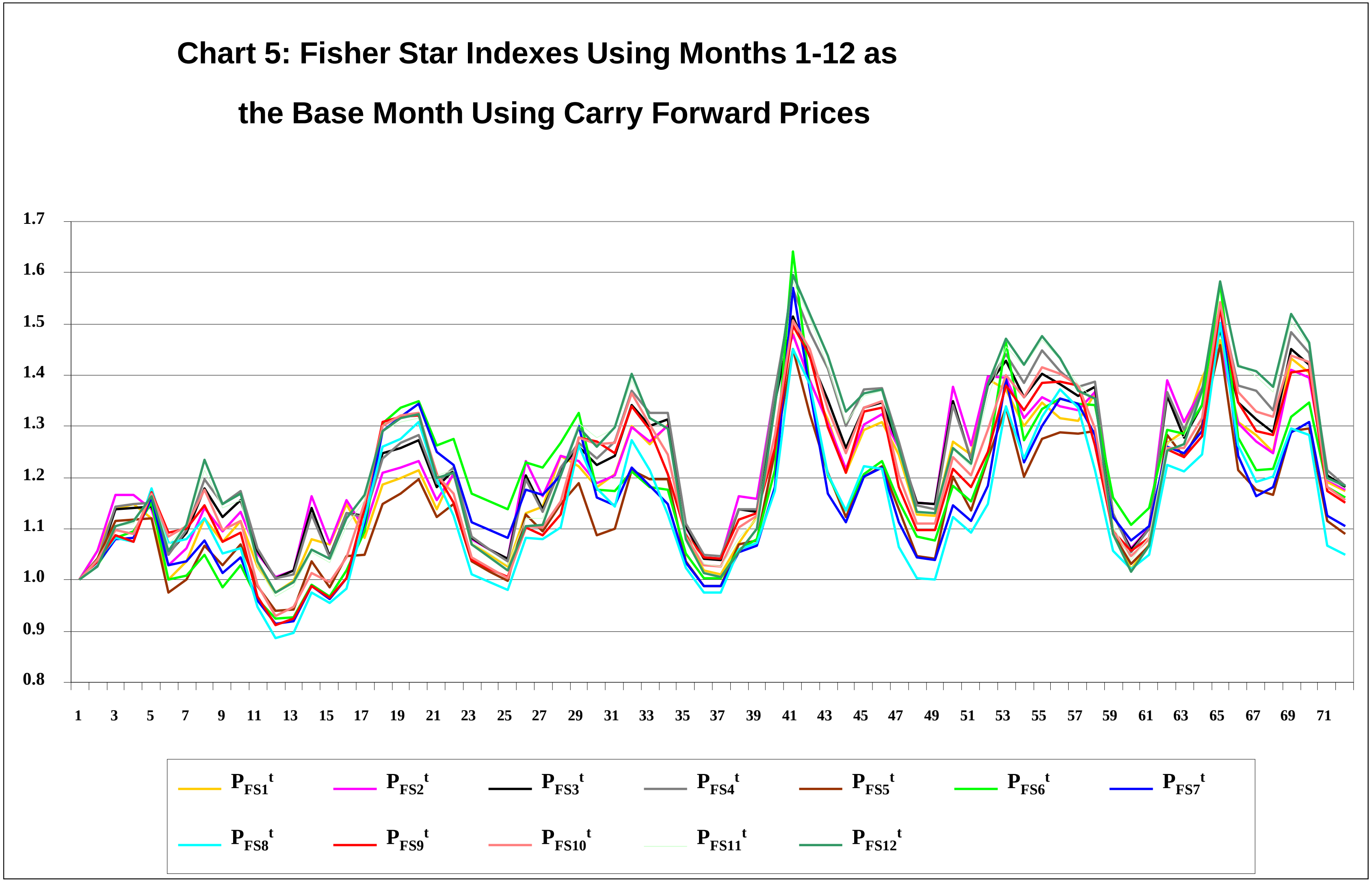
Our conclusions regarding the construction of annual indexes at this point are as follows:

- **The use of the Laspeyres and Paasche annual indexes should be avoided.**
- **The amount of chain drift in the annual Fisher and Törnqvist Theil indexes was small for our empirical example. However, if one used the similarity linked annual Mudgett Stone indexes, there is no possibility of any chain drift.**
- **The annual fixed base Fisher and Törnqvist Theil indexes and the GEKS and Predicted Share Similarity linked indexes are all fairly close to each other in the present context where we are calculating annual indexes.**
- **Approximating "true" Mudgett Stone indexes by taking a simple average of the year over year monthly indexes can lead to substantial approximation errors. For our empirical example, the approximation error using the Laspeyres formula was substantial.**
- **The use of carry forward prices will tend to lead to annual indexes which are biased downward if there is general inflation and so in order to avoid this potential bias, it is better to use the indexes that use maximum overlap superlative bilateral indexes as their basic building blocks.**

6. Month to Month Indexes using Carry Forward Prices

- **Month to month price indexes are required for a number of purposes but the problem of missing prices is much more severe than was the case for year over year monthly price indexes where there is far more price matching of products.**
- **Here is a list of the number of seasonal products that are actually available in months 1-12 for our Israeli data: 7, 8, 8, 7, 9, 10, 8, 7, 7, 10, 9, 7. The maximum number of products is 14. Thus, for 5 out of the 12 months, only one half of the seasonal fruits are available.**
- **When we look at matches for the products that are available in both month 1 and month m = 1,…,12, we find that the number of product matches is 7, 7, 7, 6, 5, 5, 3, 3, 4, 7, 7, 7.**
- **Statistical Agencies try to deal with this problem by using carry forward prices and annual baskets. But annual baskets are not actually consumed on a monthly basis so the resulting indexes are not reliable.**
- **In reality, we cannot expect any bilateral index number to be very reliable if the number of matched products is small.**
- **To illustrate the lack of matching problem, the next slide plots the use of Fixed Base Fisher "star" indexes using carry forward prices for the missing products and using months 1-12 in our sample as the fixed base.**

6. Month to Month Indexes using Carry Forward Prices (2)



6. Month to Month Indexes using Carry Forward Prices (3)

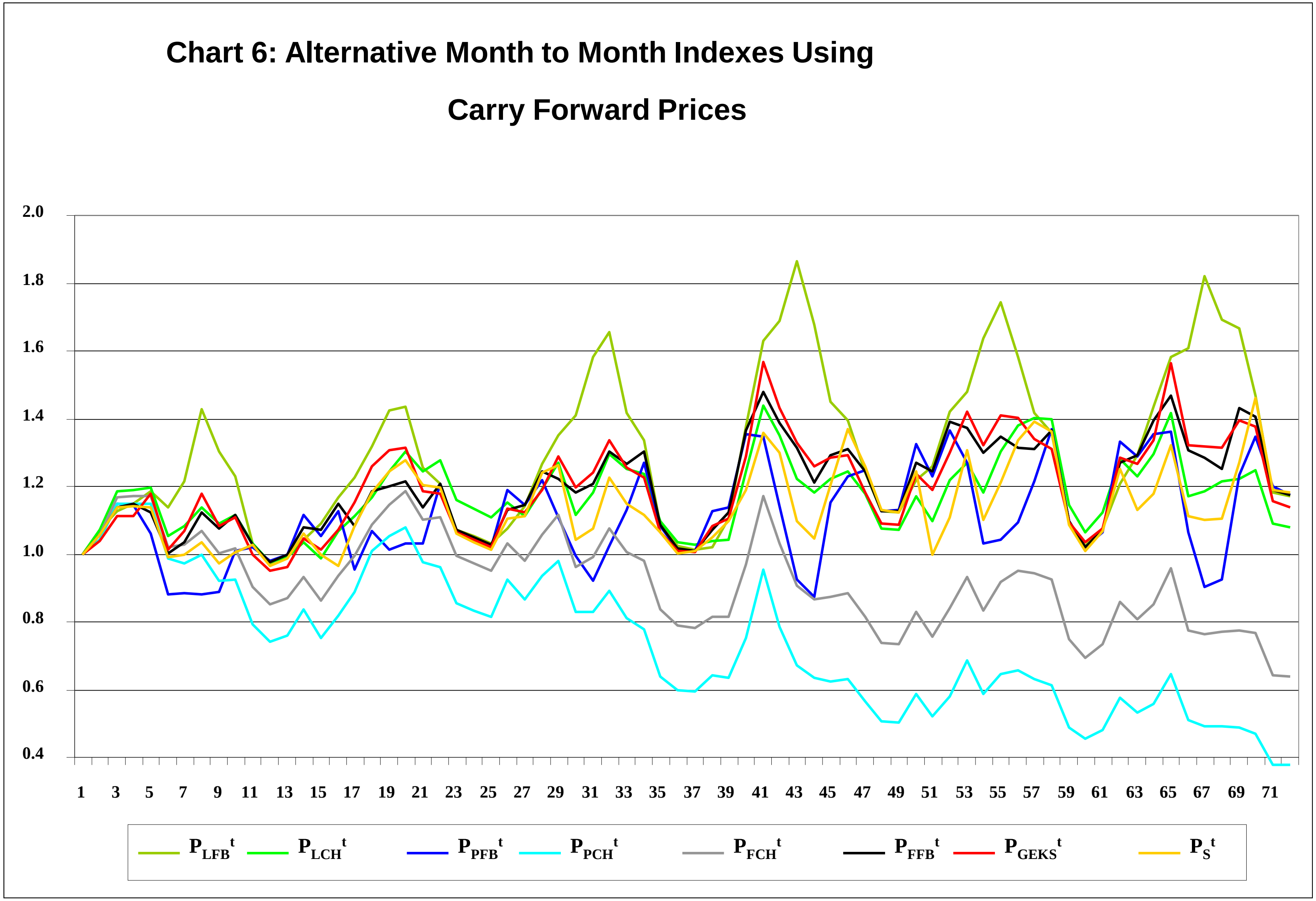
A number of points emerge from a study of Chart 5:

- **The seasonal fluctuations in prices are enormous;**
- **The choice of a base period matters;**
- **Any monthly index number is unlikely to be very reliable for our particular data set.**

The problems associated with the reliability of month to month indexes of strongly seasonal commodities are much bigger than the problem of finding reliable year over year monthly indexes.

- **As was seen in the previous sections, our best year over year monthly indexes were well behaved and approximated each other fairly well.**
- **This is not the case for month to month indexes.**
- **The above points suggest that in the month to month context, similarity linked indexes will work "best" provided the measure of relative price dissimilarity penalizes a lack of matching.**

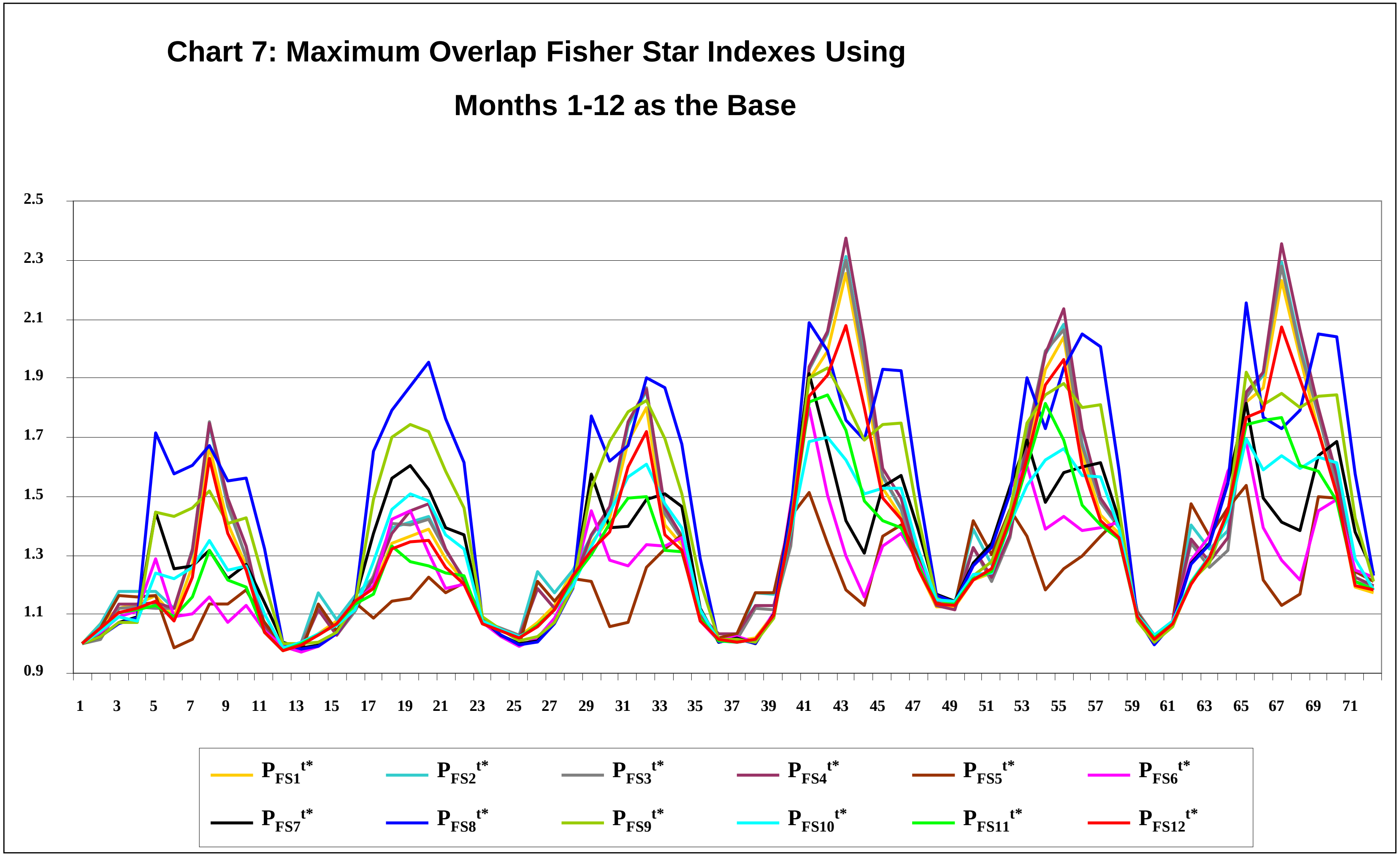
6. Month to Month Indexes using Carry Forward Prices (4)



6. Month to Month Indexes using Carry Forward Prices (5)

- The Laspeyres, Paasche and Fisher fixed base indexes end up at much the same level and the similarity linked indexes end up a bit higher. However, the seasonal fluctuations in P_S^t are much smaller.
- The 3 chained indexes are all subject to a large amount of downward chain drift. This is due to the fact that the strongly seasonal commodities come into season at relatively high prices and then trend down to relatively low prices at the end of their seasonal availability. They behave in the same manner as fashion goods, which are also subject to tremendous downward chain drift.
- The chained Laspeyres index ends up reasonably close to the 3 superlative indexes. It appears that the upward substitution bias (which a Laspeyres index is subject to) approximately offsets the downward chain drift bias that the chained indexes are subject to in the present context when beginning of season prices are generally higher than the corresponding end of season prices.
- The first two of our three "best" indexes (P_{FFB}^t, P_{GEKS}^t and P_S^t) have roughly the same mean but the similarity linked index P_S^t ends up well above P_{FFB}^t and P_{GEKS}^t for t = 72. Note that the year over year monthly indexes did not suffer from the tremendous downward chain drift that the chained Fisher and Paasche indexes exhibit.

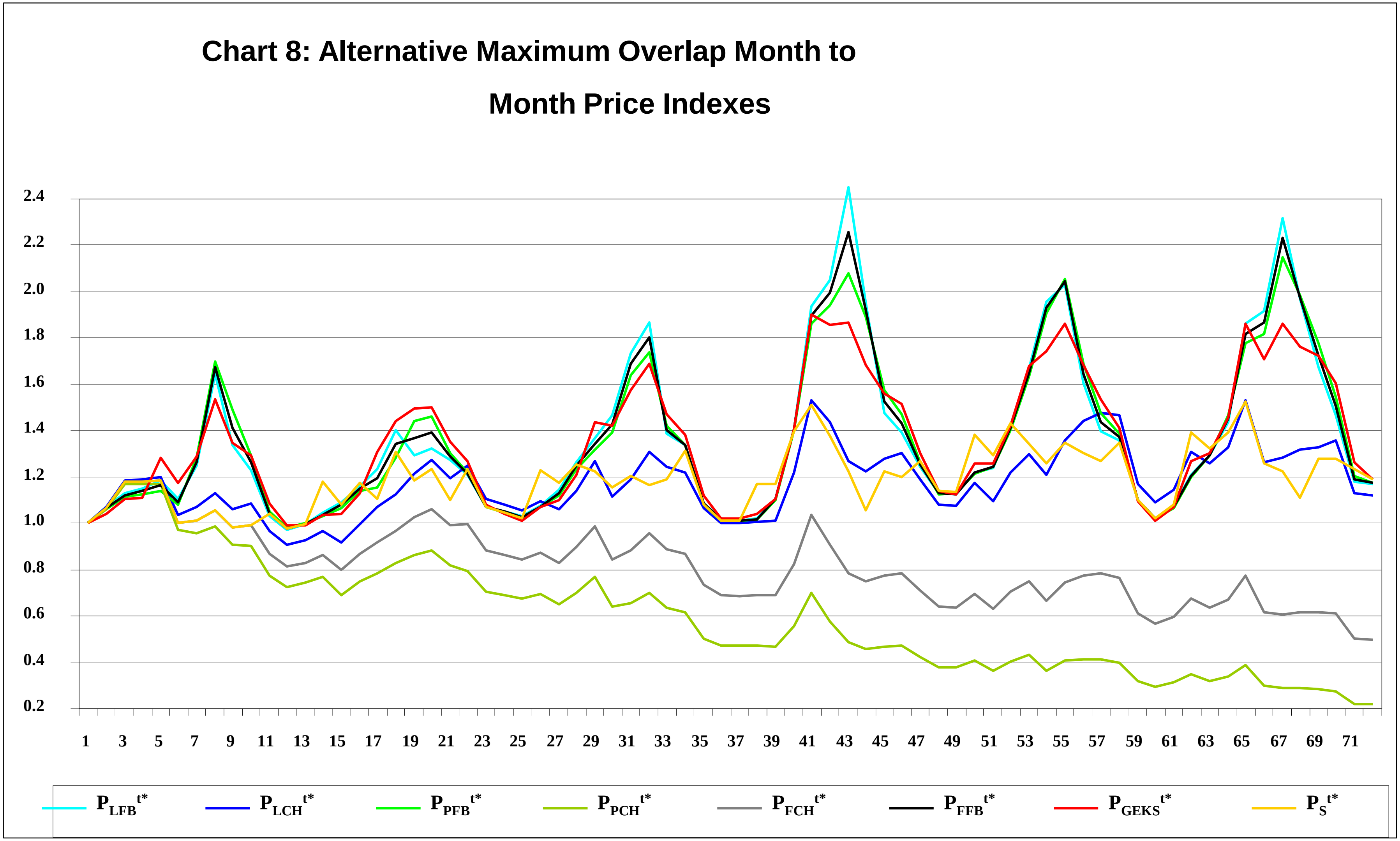
7. Month to Month Indexes using Maximum Overlap Bilateral Indexes as Building Blocks



7. Month to Month Indexes using Maximum Overlap Bilateral Indexes as Building Blocks (2)

- **The previous slide showed the fixed base maximum overlap Fisher "star" indexes using months 1-12 as the base. These indexes are constructed without imputations. It can be seen that the resulting seasonal fluctuations are very large and the 12 indexes vary a lot.**
- **A comparison of Charts 5 and 7 shows that the use of maximum overlap fixed base Fisher indexes has led to alternative fixed base indexes which are very close to each other for the months of December, January and February but have *much larger seasonal fluctuations* than their fixed base Fisher index carry forward counterparts for other months of the year.**
- **For these alternative fixed base Fisher indexes, *the use of maximum overlap bilateral Fisher indexes has led to index values in month 72 which are on average 2.68 percentage points above their carry forward fixed base Fisher index counterparts*. This implies an annual bias around 0.5 percentage points.**
- **Thus we have a rough estimate of the cumulative amount of downward bias that the use of carry forward prices induced for our empirical example over the six year sample period.**
- **Recall that the bias from using carry forward prices in the year over year context was very small; that is not the case for month to month indexes that use carry forward prices. The missing price problem is now more severe.**

7. Month to Month Indexes using Maximum Overlap Bilateral Indexes as Building Blocks (3)



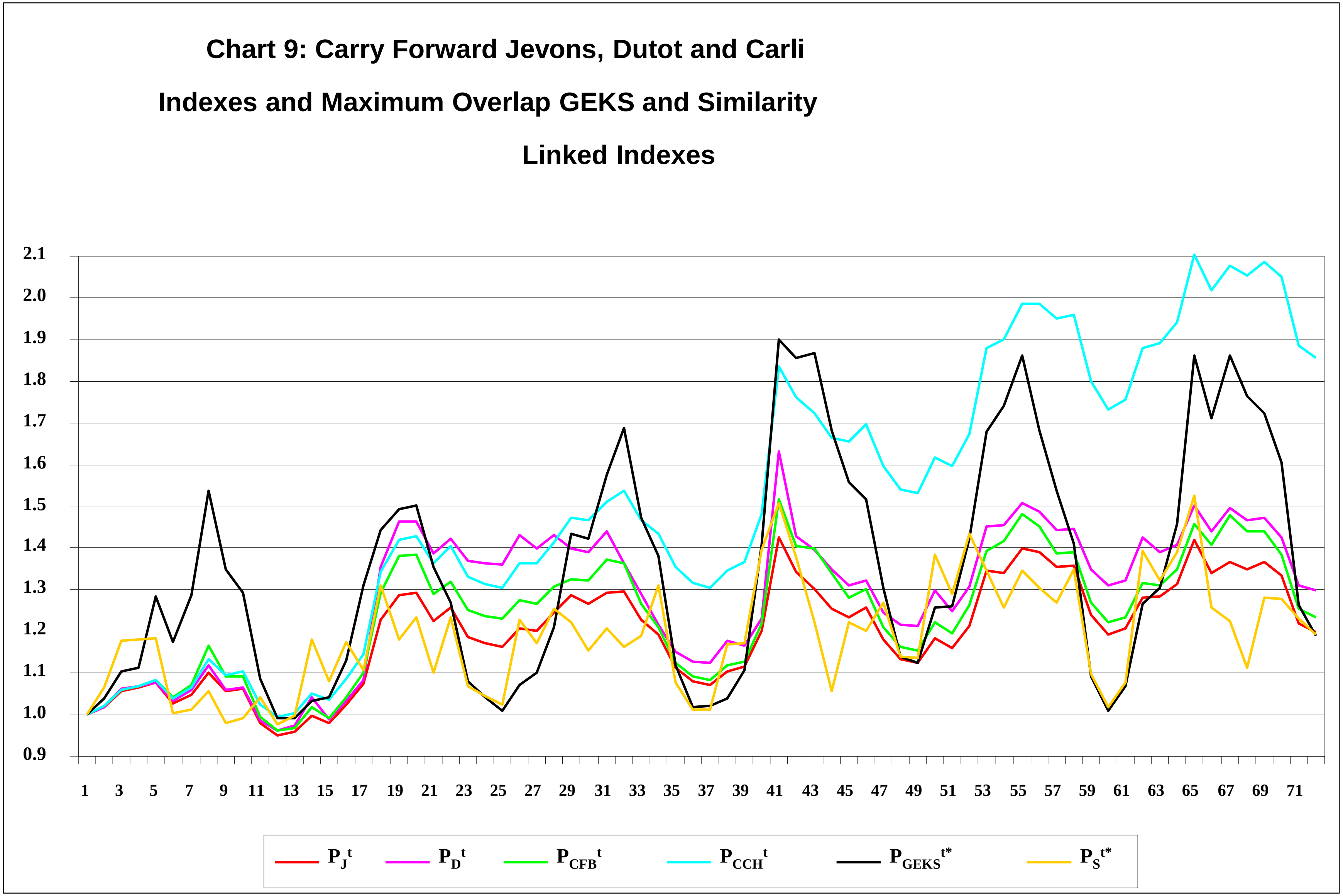
7. Month to Month Indexes using Maximum Overlap Bilateral Indexes as Building Blocks (4)

- **The maximum overlap fixed base Laspeyres and Paasche indexes, P_{LFB}^{t*} and P_{PFB}^{t*}, end up at much the same place (1.17122 and 1.17533) and have similar means (1.35950 and 1.35160).**
- **The chained Laspeyres and Paasche indexes, P_{LCH}^{t*} and P_{PCH}^{t*}, suffer from some downward chain drift and end up far apart at 1.11995 and 0.21988 respectively. The downward chain drift problem carries over to the maximum overlap chained Fisher index, P_{FCH}^{t*}, which ends up at 0.49624.**
- **Our three best indexes from the viewpoint of controlling substitution bias and chain drift bias, P_{FFB}^{t*}, P_{GEKS}^{t*} and P_{S}^{t*}, end up at 1.17327, 1.18952 and 1.19115 respectively.**
- **The means of the P_{FFB}^{t*} and P_{GEKS}^{t*} are similar at 1.3552 and 1.3468. These means are far above the mean of the similarity linked indexes P_{S}^{t*} which is 1.1892. Thus the maximum overlap similarity linked price indexes have far smaller seasonal fluctuations. This is our best month to month index.**
- **The carry forward GEKS index ended up at 1.13682. Using maximum overlap bilateral Fisher indexes, the resulting GEKS index ended up at 1.18952. Thus the use of carry forward prices led to a downward bias of 5.27 percentage points over the 6 year sample period.**

7. Month to Month Indexes using Maximum Overlap Bilateral Indexes as Building Blocks (5)

- **The chained Paasche and Fisher indexes suffer from a massive amount of downward chain drift. The remaining 6 indexes end up in much the same place.**
- **However, the seasonal peaks in 4 of the remaining indexes (the fixed base Laspeyres and Paasche indexes, the fixed base Fisher and the GEKS indexes) are huge.**
- **The Maximum Overlap Predicted Share similarity linked index P_S^{t*} has the best axiomatic properties (no chain drift and little or no substitution bias) and it has limited seasonal fluctuations for our empirical example so *it emerges as our best index*.**
- **From Chart 8, it can be seen that the chained Maximum Overlap Laspeyres index P_{LCH}^{t*} turns out to be fairly close to our similarity linked indexes and thus for this empirical example, it provides an adequate approximation to our preferred indexes. For our example, the downward chain drift bias in P_{LCH}^{t*} just nicely counterbalances the upward substitution bias that is inherent in the Laspeyres formula. But we cannot count on this cancellation of two sources of bias to occur in other examples.**

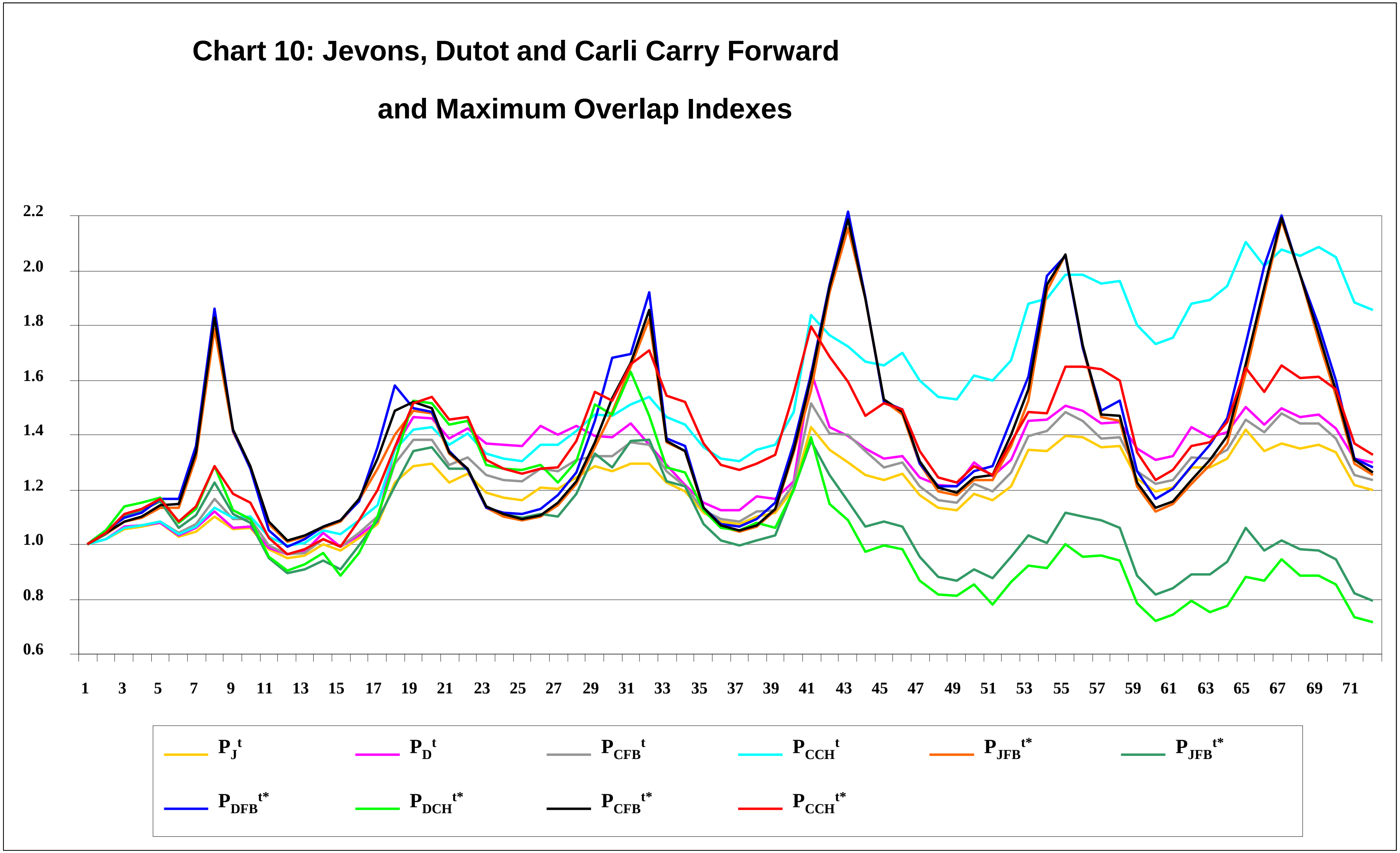
8. Month to Month Unweighted Price Indexes Using Carry Forward Prices



8. Month to Month Unweighted Price Indexes Using Carry Forward Prices (2)

- **From Chart 9, the Jevons index P_J^t approximates our "best" index P_S^{t*} fairly well; the two indexes end up in much the same place with P_S^{t*} and the indexes are always close to each other for the months of December, January and February. For mid year months, P_S^{t*} is generally below P_J^t.**
- **The Carli fixed base and Dutot indexes are in general close to each other and tend to lie above their Jevons index counterparts.**
- **There is substantial upward chain drift in the chained Carli index.**
- **For comparison purposes, two of our better maximum overlap multilateral indexes appear on the previous slide: the maximum overlap GEKS and maximum overlap Predicted Share Similarity linked indexes, P_{GEKS}^{t*} and P_S^{t*}.**
- **The seasonal fluctuations in the GEKS and chained Carli indexes are very large indeed.**
- **Conclusion: P_J^t captures the trend in P_S^{t*} quite well but has perhaps over smoothed the seasonal fluctuations (due to the use of carry forward prices).**
- **In the following section, we compute additional elementary indexes that do not use quantity or expenditure weights but instead of using carry forward prices, we will use maximum overlap unweighted bilateral indexes.**

9. Month to Month Unweighted Price Indexes Using Maximum Overlap Bilateral Indexes



9. Month to Month Unweighted Maximum Overlap Price Indexes (2)

- **In this section, we computed maximum overlap standard indexes using only price information and compare the resulting indexes with their carry forward counterparts calculated in section 7.**
- **The maximum overlap Jevons and Dutot indexes are not necessarily equal to the corresponding fixed base Jevons and Dutot indexes as was the case in the previous section when carry forward prices were used as imputations for the missing prices. Thus in general, $P_{JCH}^{t*} \neq P_{JFB}^{t*}$ and $P_{DCH}^{t*} \neq P_{DFB}^{t*}$.**
- **The six elementary indexes using bilateral maximum overlap price indexes as basic building blocks, P_{JFB}^{t*}, P_{JCH}^{t*}, P_{DFB}^{t*}, P_{DCH}^{t*}, P_{CFB}^{t*} and P_{CCH}^{t*}, are plotted on the previous slide along with the four elementary indexes that used carry forward prices from the previous section, P_J^{t}, P_D^{t}, P_{CFB}^{t} and P_{CCH}^{t} for comparison purposes.**
- **The four chained maximum overlap indexes all suffer from some form of chain drift: the maximum overlap chained Carli P_{CCH}^{t*} ends up high at 1.3245 while the carry forward chained Carli index P_{CCH}^{t} ends up very high at 1.855. The chained maximum overlap Jevons and Dutot indexes, P_{JCH}^{t*} and P_{DCH}^{t*} end up very low at 0.7914 and 0.7168 respectively.**
- **Our "best" index using price and expenditure information was the maximum overlap similarity linked index P_S^{t*} which ended up at 1.1911.**

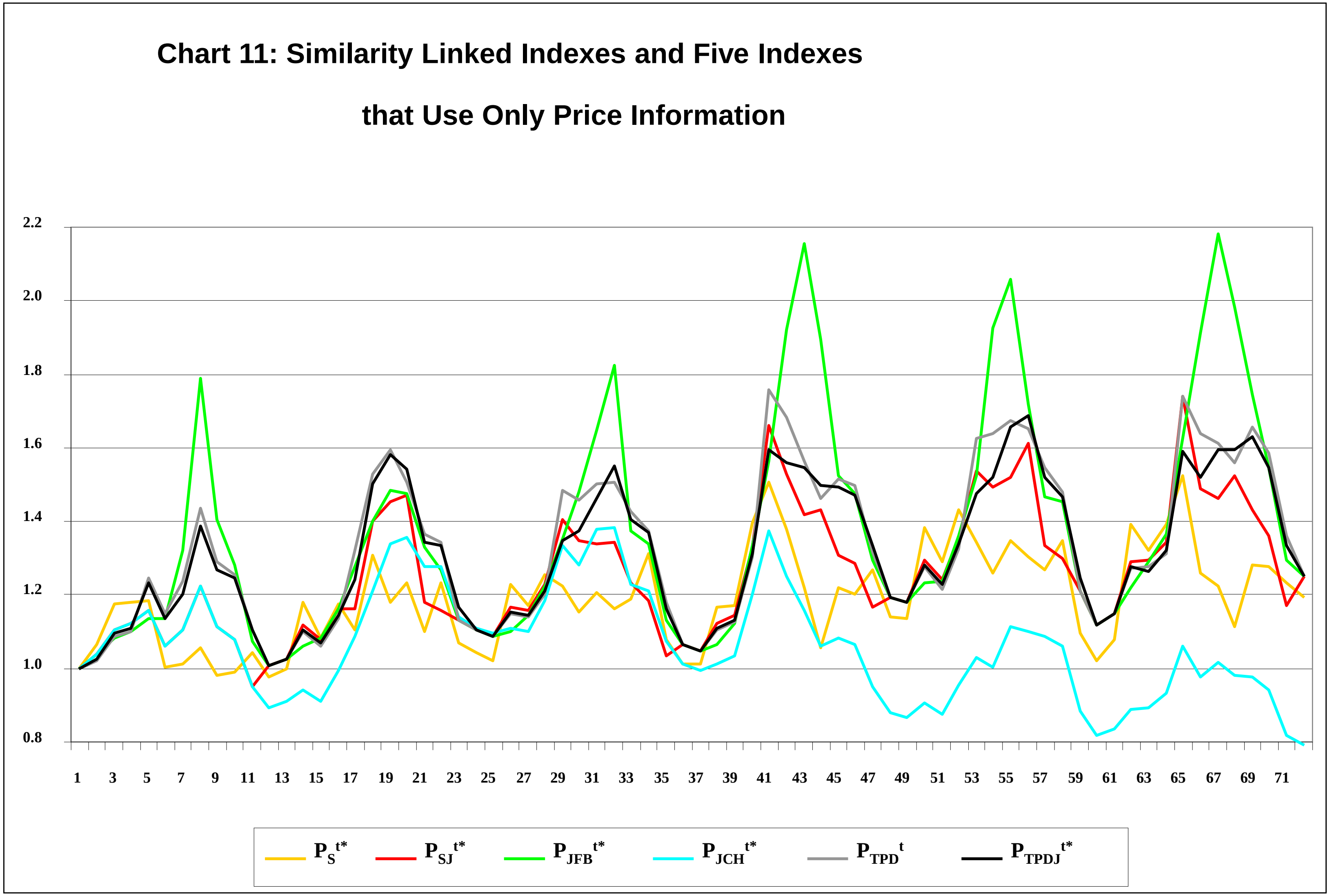
9. Month to Month Unweighted Maximum Overlap Price Indexes (3)

- **The use of carry forward prices can lead to significant bias as compared to the same index which uses maximum overlap indexes.**
- **The mean of the fixed base Jevons indexes using carry forward prices (the P_J^t) is 1.1981 while the mean of the fixed base maximum overlap indexes P_{JFB}^{t*} is 1.3690. Thus on average, the downward bias in the use of the carry forward indexes using the Jevons formula is 1.3690 – 1.1981 or 17.09 percentage points.**
- **Similarly the downward bias in the use of carry forward prices using fixed base Dutot indexes is 1.4049 – 1.2845 or 12.04 percentage points and the downward bias in the use of carry forward prices using fixed base Carli indexes is 1.3835 – 1.2413 or 14.22 percentage points.**
- ***Thus the use of carry forward prices for elementary indexes in situations where there is general inflation cannot be recommended due to the potentially large downward bias that the use of carry forward prices can generate.***
- **We conclude this section by considering two multilateral methods that just use price information for many periods: the time product dummy method and a prices only version of the predicted share relative price similarity based linking method.**

9. Month to Month Unweighted Maximum Overlap Price Indexes (4)

- **The Predicted Share Similarity Linked indexes depended on the availability of quantity (or expenditure) information but in the present context, only price information is available. How then can actual and predicted shares be defined in the prices only context?**
- **When quantity and expenditure information is not available, it is natural to assume that either quantities purchased in a month or expenditures on available products are equal. The assumption of equal quantities depends on units of product measurement, which are to some extent arbitrary and so we make the assumption of equal expenditures on available products in each month. This assumption is equivalent to an assumption that actual expenditure shares on available commodities in a month are equal.**
- **Once (imputed) expenditures have been defined, imputed quantities can be defined by dividing imputed expenditures by prices and the predicted share dissimilarity matrix can be defined using the bilateral maximum overlap Jevons formula $P_J^*(t/r)$ in place of the bilateral Fisher index and the real time *Similarity Linked Maximum Overlap Jevons indexes*, P_{SJ}^{t*}, can be calculated.**
- **In the following slide, P_{SJ}^{t*} is compared to the Predicted Share indexes that use actual expenditure information, P_J^{t*} defined in previous sections.**

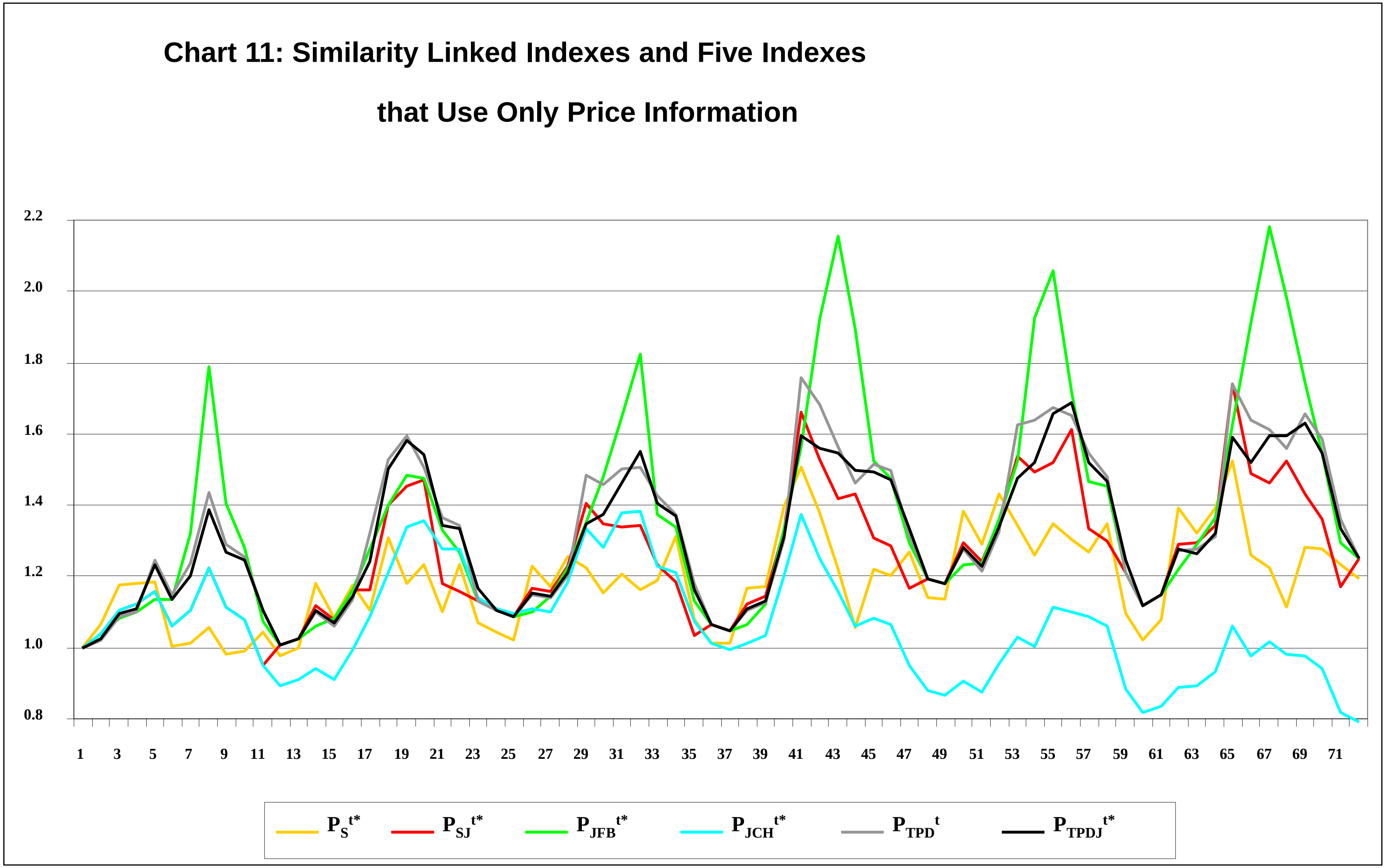
9. Month to Month Unweighted Maximum Overlap Price Indexes (5)



9. Month to Month Unweighted Maximum Overlap Price Indexes (6)

- **Chart 11 also plots the maximum overlap fixed base and chained Jevons indexes, P_{JFB}^{t*} and P_{JCH}^{t*}. The chained Jevons index, P_{JCH}^{t*}, has a large downward bias and the fixed base Jevons index, P_{JFB}^{t*}, has a large upward bias on average due to its huge seasonal fluctuations. Thus maximum overlap Jevons indexes do not work well for the Israeli data.**
- **The Time Product Dummy index P_{TPD}^{t} is a natural generalization of the Jevons index to the case of missing observations; see Chart 11 above.**
- **A possible disadvantage of using the Time Product Dummy indexes P_{TPD}^{t} is that every month when there is a new observation, the indexes have to be recomputed and there is the problem of linking the new index for the latest month with the prior indexes.**
- **A possible solution to this problem is the following one. (i) Compute the Time Product Dummy indexes for a historical data set that consists of 12 consecutive months. Call the resulting indexes P_{TPD}^{t} for m = 1,...,12. (ii) Set the *Mixed TPD and Jevons index*, P_{TPDJ}^{t}, for the first 12 months equal to the corresponding Time Product Dummy indexes so that $P_{TPDJ}^{t} = P_{TPD}^{t}$ for t = 1,...,12. (ii) For subsequent months, use the year over year fixed base maximum overlap Jevons indexes P_{JFm}^{y*} to link month m in year y ≥ 2 to P_{TPDJ}^{m}.**

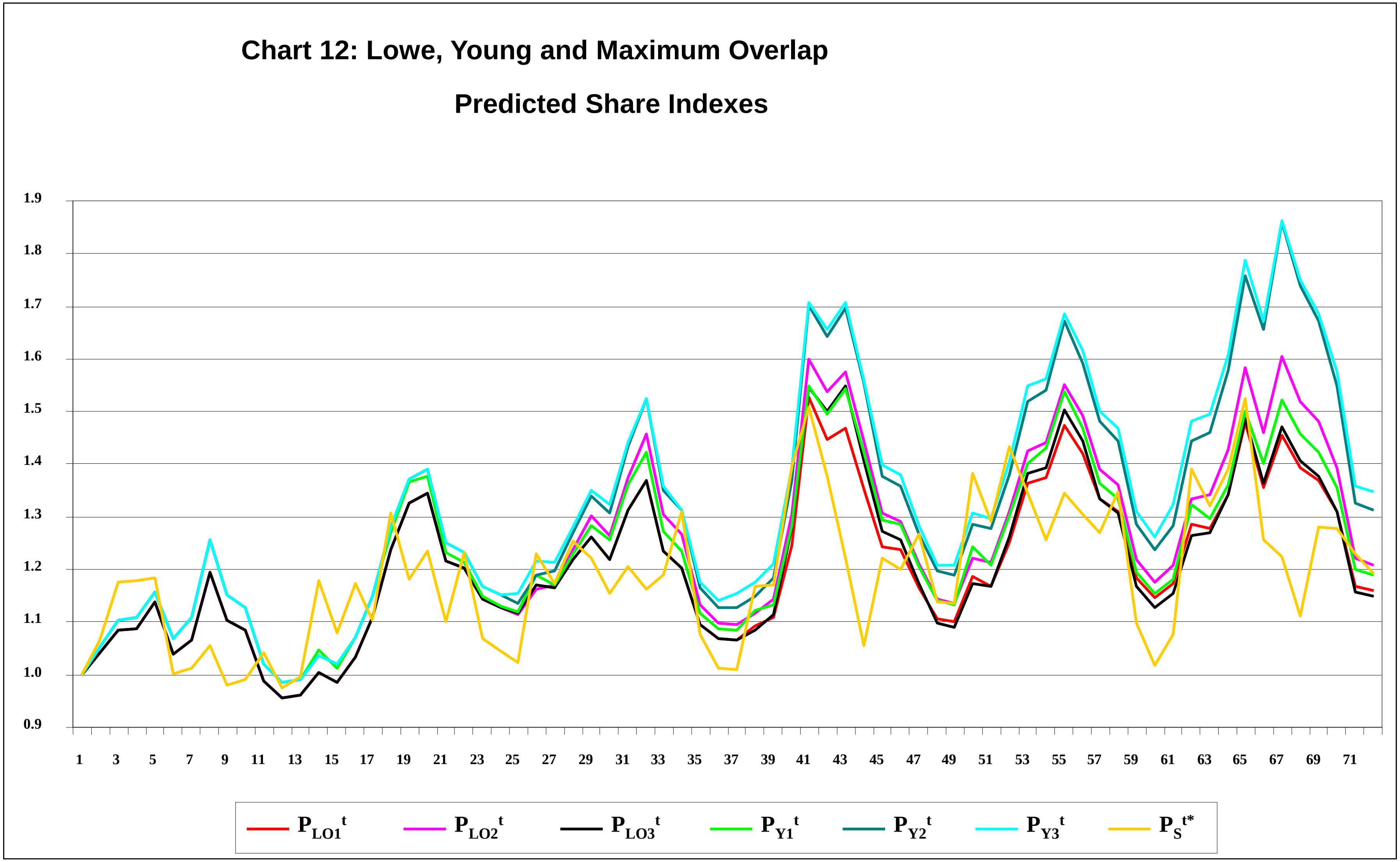
9. Month to Month Unweighted Maximum Overlap Price Indexes (7)



8. Month to Month Unweighted Maximum Overlap Price indexes (8)

- **Chart 11 shows that P_S^{t*} has by far the smallest seasonal variations.**
- **Relative to this preferred index, the chained Jevons index, P_{JCH}^{t*}, has a large downward bias and the fixed base Jevons index, P_{JFB}^{t*}, has a large upward bias on average due to its huge seasonal fluctuations.**
- **The remaining three indexes, P_{SJ}^{t*}, P_{TPD}^{t} and P_{TPDJ}^{t*}, finish at the same point which is 6 percentage points above our preferred index (if price and quantity information were available) P_S^{72*}.**
- **These three indexes that make use of price data only are fairly close to each other but the similarity linked Jevons index, P_{SJ}^{t*}, tends to lie below the two Time Product Dummy indexes, P_{TPD}^{t} and P_{TPDJ}^{t*}, and P_{SJ}^{t*} has smaller seasonal fluctuations.**
- **Overall, for our particular example, the similarity linked index that uses only price data and bilateral maximum overlap Jevons indexes P_{SJ}^{t*} provides the best approximation to our preferred index, P_S^{t*}.**
- **But of course, all of the indexes that use only price data have a considerable amount of bias compared to our "best" index that utilizes both price and quantity information.**

10. Annual Basket Lowe Indexes and Annual Share Weighted Young Indexes



10. Annual Basket Lowe Indexes and Annual Share Weighted Young Indexes 2

- **None of the annual basket or annual expenditure share indexes provide an adequate approximation to our preferred similarity linked index, P_S^{t*}.**
- **The large upward seasonal fluctuations in the two partially chained Young indexes, P_{Y2}^t and P_{Y3}^t, are particular cause for concern.**

Our conclusions for this section are as follows:

- **In the strongly seasonal products context, Lowe and Young indexes using carry forward prices for missing products are subject to both carry forward bias and substitution bias and are unlikely to approximate alternative indexes that have better axiomatic and economic properties.**
- **Lowe and Young indexes have no rigorous conceptual foundation in the strongly seasonal context and do not provide answers to any practical price measurement problem.**

12. Conclusion

- **This paper has considered *four main classes of alternative price indexes* that could be constructed for a strongly seasonal class of commodities:**
- **Year over year monthly indexes (see sections 2 and 3 above);**
- **Annual indexes (see sections 4,5 and 11);**
- **Month to month indexes that measure consumer price inflation going from one month to the next month (see sections 6 and 7 for indexes that make use of price and quantity information and sections 8 and 9 for indexes that use only price information);**
- **Month to month annual basket indexes (or annual share indexes) that make use of annual quantities or annual expenditure shares for a base year and monthly prices (see section 10 for the Lowe and Young indexes).**

As was discussed in section 10, in the strongly seasonal commodities context, Lowe or Young indexes have little intuitive appeal. Consumers do not purchase an annual basket of strongly seasonal commodities in each month nor do they face carry forward prices each month for this hypothetical annual basket of commodities.

12. Conclusion (2)

- **The other three types of index have strong justifications. Month to month indexes are required by central banks and others to monitor short run movements in inflation.**
- **Annual indexes are needed as deflators to produce annual constant dollar national accounts.**
- **Strictly speaking, year over year monthly indexes do not have as high a priority as month to month and annual indexes but it turns out that in the strongly seasonal commodities context, year over year monthly indexes are far more accurate measures of inflation than month to month indexes. Moreover, the year over year monthly indexes are basic building blocks for accurate annual indexes.**
- ***Thus in the strongly seasonal commodities context, all three types of index serve a useful purpose*.**