

Key Thoughtz:

- AMLCD prices fluctuate with accelerating capacity, which is not synchronous with the solar calendar.
- Fluctuating prices make sales revenue an unreliable measure of seasonal demand.
- Display area shipments provide the best view of seasonal demand patterns.
- Data from leading producers show no change in the historic pattern of seasonal demand for AMLCD area.

AMLCD Seasonal Patterns Persist

Some analysts are quick to claim things are different now; others less so. BizWitz analysts tend to place events in historical context based on observations dating back to the mid 1990's. From that perspective, things are more the same than different, today.

In this commentary, we examine public disclosures by AU Optronics (TSE: 2409) and LG Display (SEO: 034220) for evidence that seasonal business patterns have changed for AMLCD producers. We find that the quarterly share of annual display area shipments in 2009 looked much like other years since 2003. Producer sales patterns show less consistency in US dollar terms because of exchange-rate variations. Nevertheless, their seasonal sales levels correlate 91% from Q1'03 through Q4'09. Moreover, their areal-price fluctuations exhibit 97% correlation. From this we conclude that producers face cyclic prices out of rhythm with the calendar while their customers place delivery orders in a consistent seasonal pattern. There is no evidence that this seasonal pattern changed in 2009.

Seasonal Patterns

A company may ship the same number of goods each quarter but report different sales revenues for three reasons.

- Market prices for the same goods might vary.
- Exchange rates might affect sales priced in other currencies.
- Product mix (blend of goods) might vary by company over time.

We therefore prefer to evaluate seasonal patterns using shipments, which vary with demand more than with other factors. We observe that prices change to bring demand and supply into equilibrium (though equilibrium is seldom achieved and often challenged). Prices and thereby sales may change if supply changes alone, without any significant change in demand. This is a common occurrence in the AMLCD market because producers add capacity in large chunks: their

customers gain bargaining power when capacity surges so their prices decline separate from any change in actual demand. Furthermore, the typical capacity cycle is two and one-half years long. As a result, surges of capacity do not follow a seasonal pattern.

Demand may vary by season for two reasons. Consumer preference is the chief reason: demand for baseballs and footballs will peak at different times. Supply chains also influence seasonal demand for producers: longer, slower ones need shipments before shorter faster chains do, even in the same seasonal marketplace. Considering the AMLCD market, we observe that most consumer market segments exhibit similar seasonal patterns of demand but some supply chains are longer than others. As a result, OEM/ODM demand for small panels often peaks earlier in the year than demand for large panels do.

In addition, new fads arise from time to time. For example, digital picture frames were all the rage in Christmas 2007. Producers may respond to such fads by altering their product mix. In this instance, their portion of 5" to 10" AMLCD shipments increased. We note, however, that some producers compensated for declining picture frame demand in 2008–2009 by introducing netbook PC displays in the same size range. That adjustment is typical of AMLCD producers' behavior and it is rational. Their average areal price tends to be similar over a wide range of sizes and their production mix can (and does) change from day to day.

What matters most is how much display area producers deliver, not what product mix they offer: most of their costs derive from display area, not displays. We therefore consider display area shipments to be the best indicator of seasonal variations in demand. So far, we do not observe substantial variations in seasonal demand among key AMLCD market segments: demand for panels tends to peak between August and November. Demand for small panels tends to peak earlier in this range, as mentioned previously. Demand for larger panels, especially TV panels, peaks later and these account for the bulk of display area. Thus, more AMLCD display area is delivered in the fourth calendar quarter (e.g. Q4'09) than in earlier quarters.

We admit that the timing of holidays varies from region to region. It is possible that rising consumer purchasing power in China or India will shift peak demand on a global basis because gift-giving events occur on lunar calendar dates rather than solar calendar dates. For example, the Mid-Autumn (Moon) Festival celebrated in China, Korea plus many countries in Southeast Asia occurs on various solar calendar dates from September to October. Some years, the festival falls on or near the Chinese National Day holiday (October first), which increases its effect on consumer spending. Similarly, Diwali is a major festival in India that follows the Hindu calendar. It can range from September to

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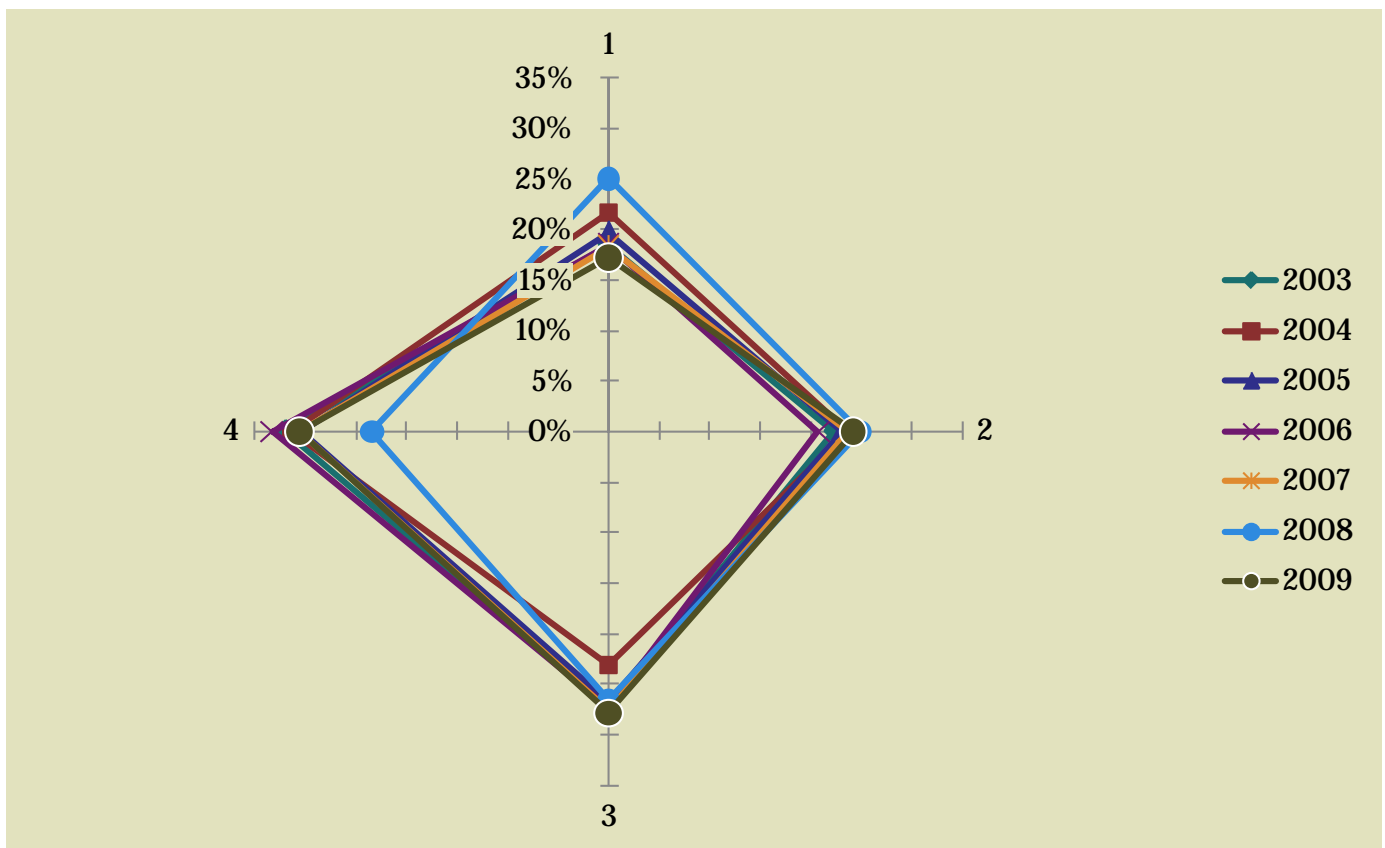
November in the solar calendar. As we will see from the data, however, there is no evidence that consumer preferences in these emerging markets have affected seasonal patterns.

Display Area Patterns

Both AU Optronics (AUO) and LG Display (LGD) report the amount of display area they deliver each quarter. In addition, they report these amounts on a consolidated (global) basis. Since the two companies account for more than one-third of global AMLCD production, their quarterly presentations indicate market conditions for panel makers as a whole. We also appreciate the fact that AUO capacity averaged 17% of total AMLCD capacity for the past seven years while LGD capacity averaged 20%. Their shares are close enough for us to assume that company effects do not distort the findings.

Combining the number of square meters shipped each quarter by both companies allows us to plot the seasonal patterns since 2003. The following chart plots the percentage of annual area shipped each quarter by year.

Quarterly Share of Annual AMLCD Area Shipments, 2003–2009



Source: company disclosures; combined results

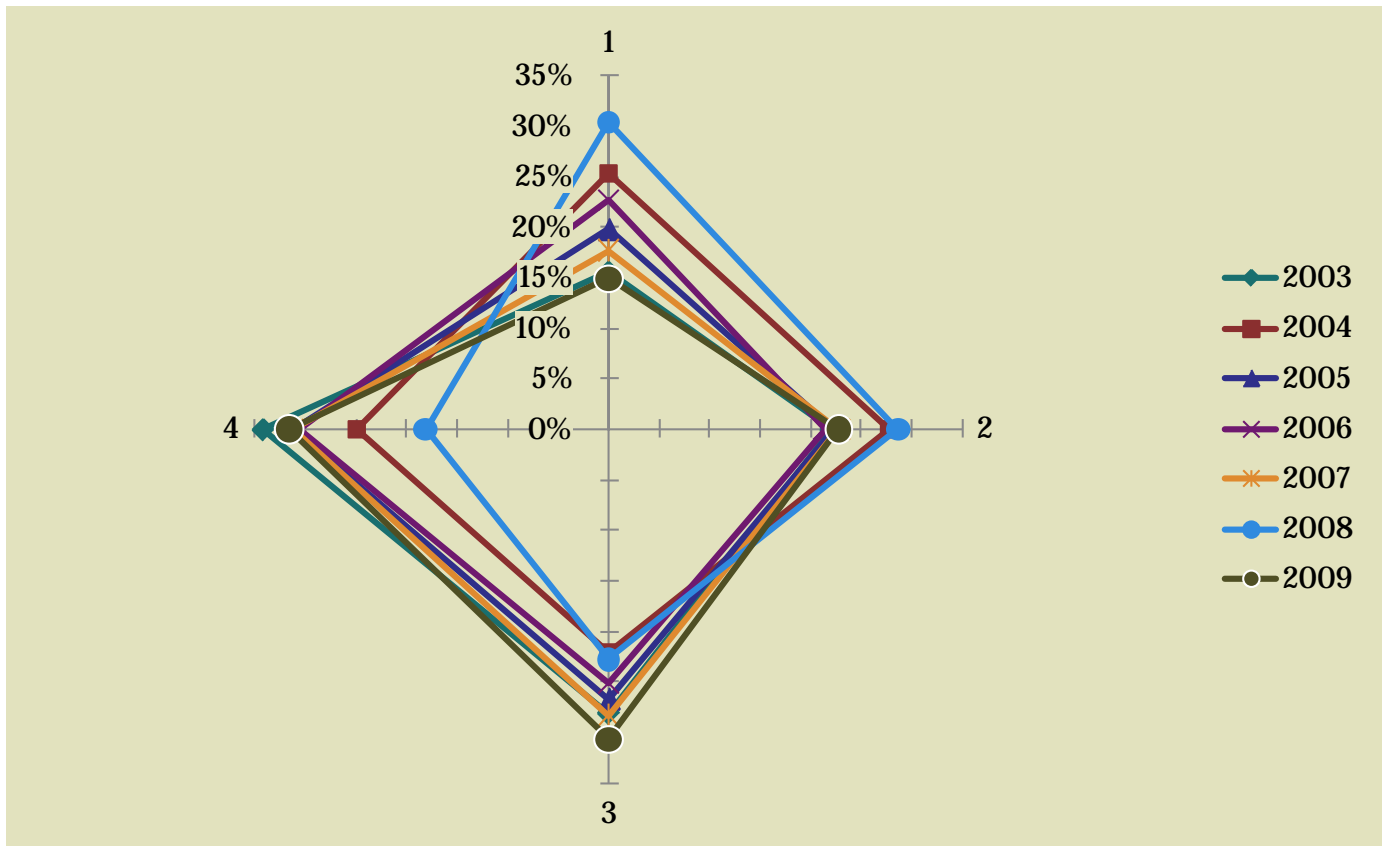
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A quick glance tells us that the credit crisis of 2008 disrupted the market with macro-economic dynamics. The only other year of note was 2004 when these producers were issuing convertible bonds or public shares. Both companies came to the securities market in early 2004 and put their best foot forward by shipping as much as they could before new capacity came on-line and spoiled product prices in 2H'04. The chart reflects this by showing a larger than typical portion in Q1'04 and a smaller than typical portion in Q3'04. We can see that Q1'09 had a smaller than usual portion of annual area delivered but we believe this reflects a continuation of adverse macro-economic effects, which included damage to the AMLCD supply chain itself. By 2H'09, producer output converged back to the historical trend.

Sales Patterns

If we convert the reported sales of AUO and LGD into US dollars each quarter, we can plot the seasonal pattern of their combined sales for each year from 2003 to 2009. Looking at the resulting chart, below, we see more variance than we did for display area.

Quarterly Share of Annual AMLCD Sales (USD base), 2003–2009



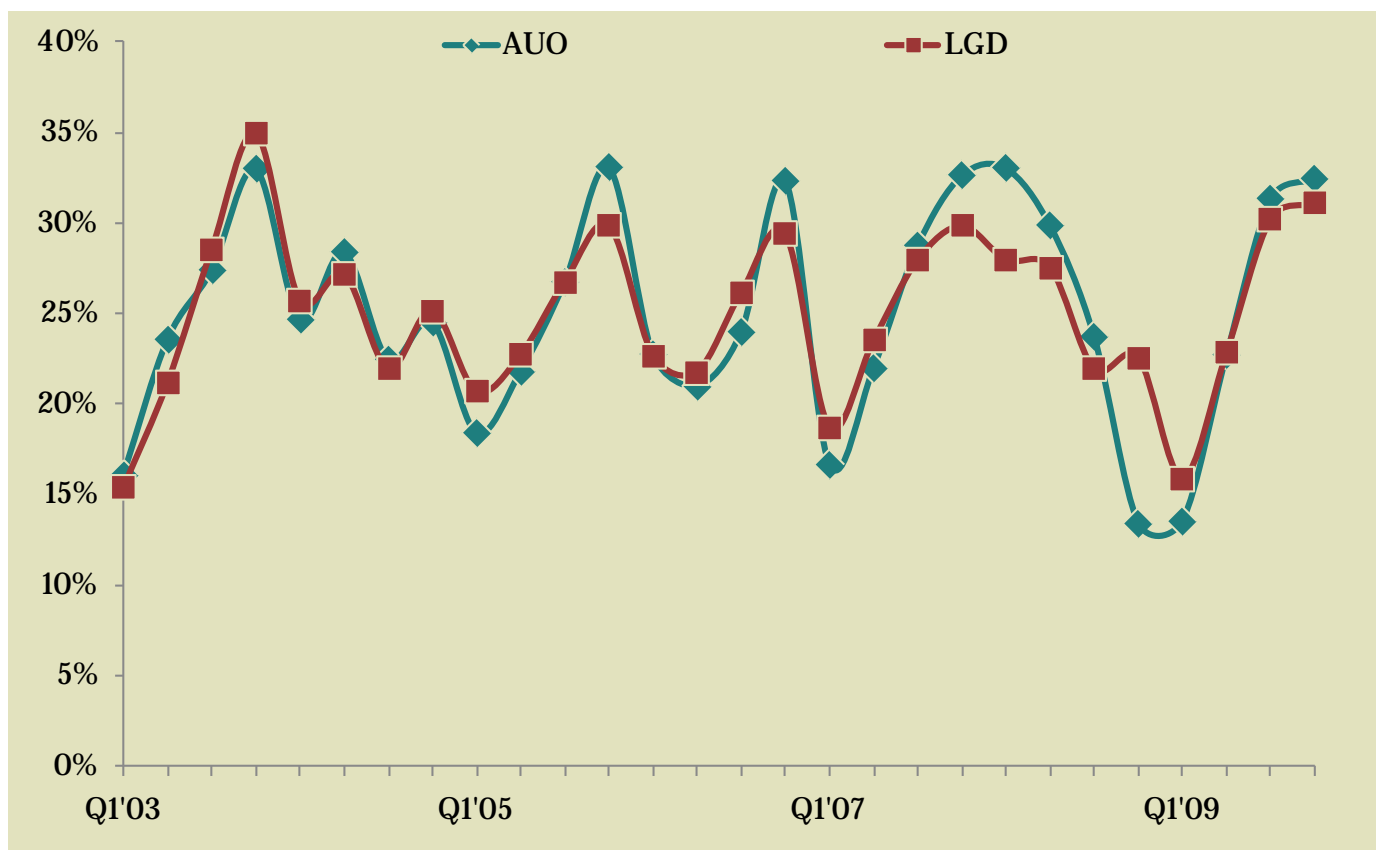
Source: company disclosures; combined results

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Again, the patterns in 2004 and 2008 stand out from the rest. Ignoring those years, however, we can see a wider spread between the lines than we do in the area chart. We must therefore consider if differences in product mix or pricing between the two companies influences the seasonal sales pattern.

We therefore plot the seasonal contribution of annual sales for each producer in the following chart. The two curves correlate 91% over the seven years, which confirms what our eyes tell us: their sales moved together.

Correlation of Seasonality of Sales (USD base), 2003–2009



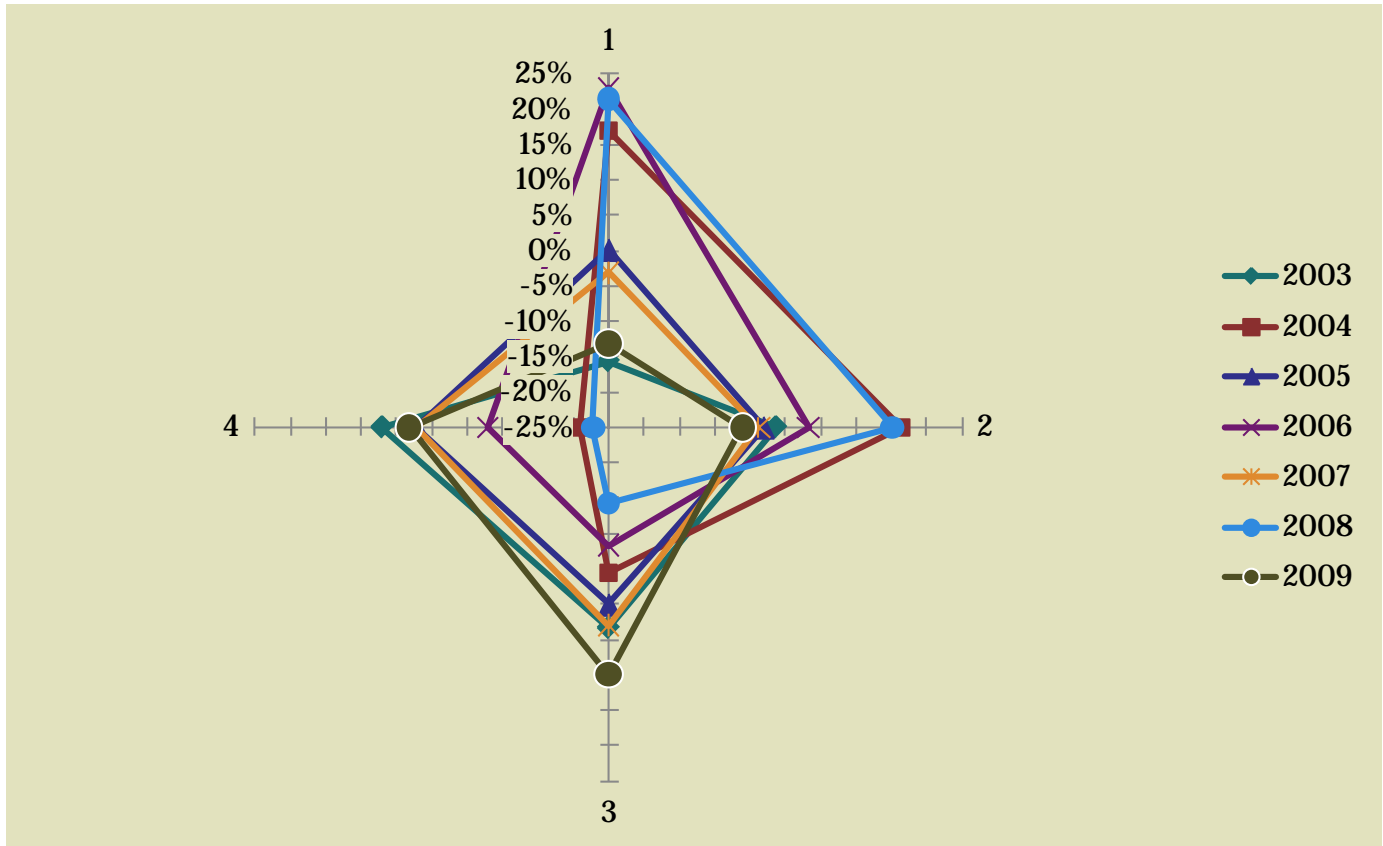
Source: company disclosures; native currencies converted to US Fed rates at the end of each quarter

Our eyes can also see that fluctuation is the historical norm. Indeed, if we recall events in 1999–2000 (the dot-com/millennium bust) the swing from 15% in Q1'09 to 31% in Q4'09 seems unsurprising. The data exhibits strong seasonal patterns for both companies.

This leads to questions about pricing and its effect on seasonal sales patterns. If we divide combined sales by combined area, we obtain the following chart. It is easy to see that there is no established pattern over the years.

AMLCD Seasonal Patterns Persist > Sales Patterns

Quarterly Share of Average Annual AMLCD Price/m² (USD base), 2003–2009



Source: company disclosures; combined results

As mentioned earlier in this study, surges of capacity (supply) cause prices to fluctuate independent of anticipated demand. Demand is a function of price, and if producers want demand to balance increasing supply, they must adjust their price. Most important for this study is the observation that surges in supply follows a capital cycle, which is not seasonal. The capital cycle results from physical, financial and emotional factors. It can speed-up or slow down for several reasons. For example, changes in national (investment) policy influence the extent and timing of fab construction in 2010–2012 as producers vie for access to Chinese government money.

The chart of areal price patterns above exhibits no consistent pattern from year to year because the pricing power of producers changes independently of the calendar. We admit there is some seasonal trend based on commercial dynamics: producers have more pricing power when brands seek delivery commitments for peak months than at other times. Overall, however, we recognize more influence from supply; exemplified by rising prices in Q1'10 when commercial demand is not great but supply constraints increase producer's pricing power.

Present Conditions

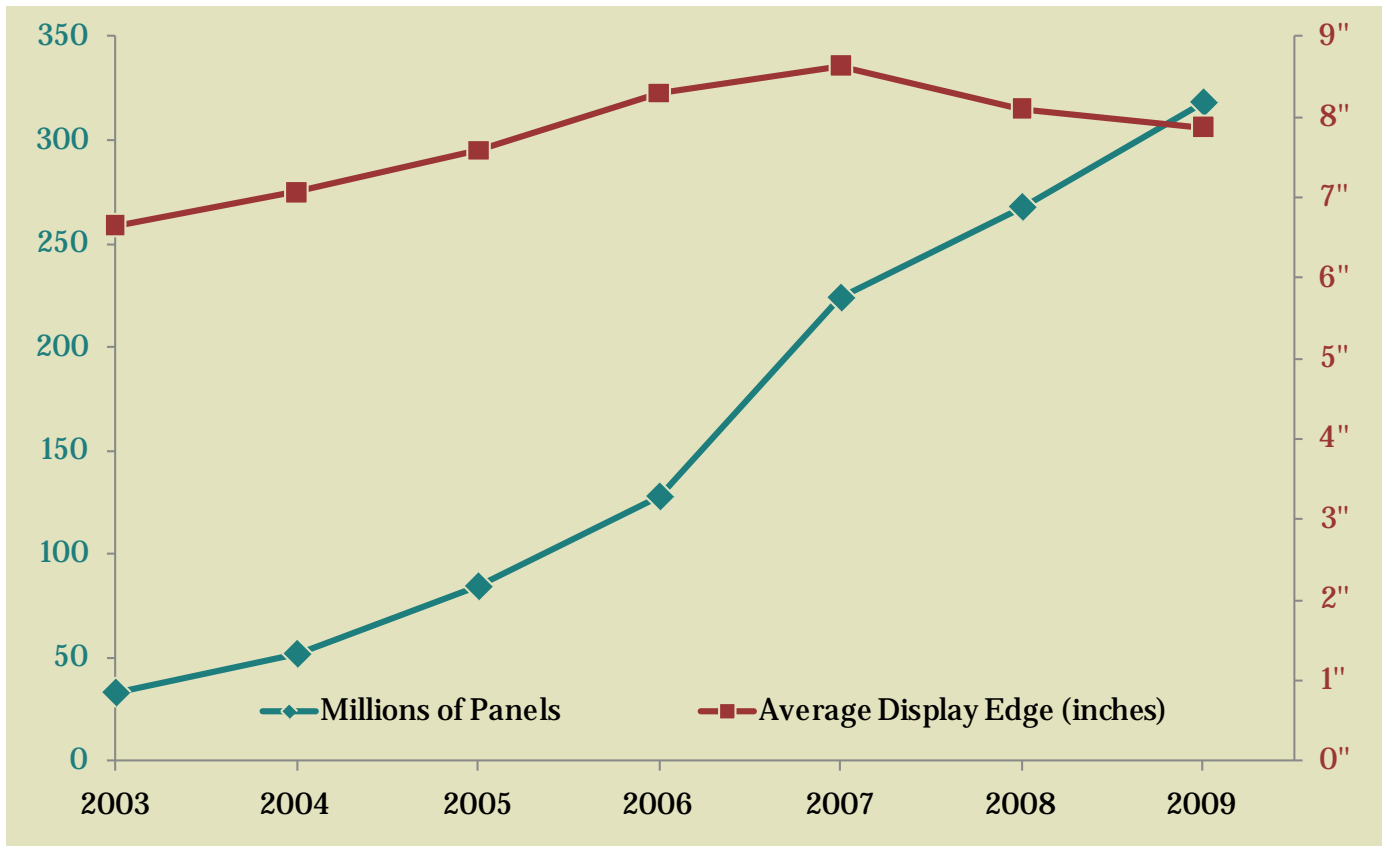
With the exception of 2008, when markets reacted to the worst financial crisis of the past seven decades, the annual portion of AMLCD area delivered increased from the first to the fourth calendar quarter. We imagine potential for this pattern to change as countries with large populations and lunar calendars (for key holidays) consume a larger share of display area in the form of end products. At present, however, there is no data to confirm a new seasonal pattern.

A thorough examination of all the factors that might influence a new seasonal pattern is beyond the scope of this study but we offer a few observations of present conditions for your consideration. We classify these as internal, arising from AMLCD industry dynamics, and external, arising from macro-economic factors or general commercial trends.

Internal Factors

The average AMLCD size has decreased since 2007 after years of increase, as shown in the following chart (using AUO data).

Panel Shipments and Average Display Edge by AU Optronics



Source: BizWitz analysis of public disclosures

We believe that this shift in direction results from three market factors.

- Demand elasticity implies that increasing demand relies on decreasing price and reducing display size supports this goal.
- Diminishing returns to scale constrain producers' abilities to expand capacity for larger display fabrication plants.
- Wireless infrastructure enables more attractive small-panel products, which has increased demand for handhelds.

As plotted in the chart, AUO results indicate that most of the increase in unit shipments in 2008 and 2009 came from small (less than ten diagonal inch) panels. The average display edge (based on the average display area independent of aspect ratio) decreased from 8.6" in 2007 to 7.9" in 2009.

This trend may continue for the next three years; we would be surprised to see the average size to increase but it might level out. The TV market in Europe and the USA, where consumers bought larger LCD TV sets each year prior to the crisis, remains constrained by household budgets. The TV market in China and other developing regions depends on availability of value-priced products. In addition, the credit crisis forced some delays in producer capacity plans, which leads to slower expansion of high-end TV panel supply.

The advent of smart phones, e-readers, netbooks and tablets is a more positive reason for the decline in average display size. These products exploit the wider data bandwidths provided by 3G (soon 4G) and Wi-Fi companies around the world. It is hard to overstate the transforming effects of wireless systems on our lives today and we can only imagine what even wider 4G coverage will do for us in the next three years. Handheld devices may use smaller displays than the TV in our living room does but many people will buy several small-display products for various reasons.

Thus, while we can imagine lunar holidays shifting peak consumer TV demand away from the solar year-end, we also imagine the weight of smaller panel shipments offsetting that shift somewhat. For now, we postulate that the weight of small-panel demand will compensate for small shifts in TV demand into the lunar new-year time frame (Q1).

Last, but not least, we assume that mergers between Taiwanese AMLCD producers and continuing restructuring in the industry (e.g. Toshiba's possible exit) will lead to additional adjustments of capacity allocations for particular display market segments. Such adjustments might soften the impact of consumer purchase patterns in developing nations.

External Factors

Macro-economic concerns weigh heavy on the minds of consumers in Europe and the USA. European governments and their national champion companies face the possibility of sovereign debt defaults and corporate restructures, which could upset their policies supporting employment. Federal and state governments in the USA face deepening budget deficits as companies reduce employment or hire only reluctantly. Numbers released by the US Bureau of Economic Analysis this month reveal that unemployment averaged 9.3% in 2009. Given their preliminary report of 9.7% for the month of January 2010, we assume that the annual unemployment rate will be worse this year.

Consumer sentiment has been happier in Asia but expectations have cooled somewhat after China tightened the supply of credit to domestic companies. In addition, Western governments and their leading banks created new worries about their pace of recovery from recession. Thus, we assume that consumer demand for display-related products will rise in developing countries at a moderate rate while display area consumption in developed countries will rise more slowly this year.

Other external factors may affect seasonal patterns more. We noted the influence of wireless services on demand for small (mobile) displays. We should also mention the influence of subscription-subsidies on consumer perception of product pricing. Bundling netbooks, smart phones or other products with network services stimulates demand. In this regard, we wonder how struggles for control of e-book pricing and other business contests will affect consumer demand for mid-sized (5" to 10" panels) products such as tablets or dedicated e-readers.

Summary

Supply chains for products using small AMLCD tend to be longer and slower than chains for larger products. We think this reduces the seasonal effects of rising LCD TV demand in countries where gift-giving holidays are not synchronized to the solar calendar. The historic seasonal pattern of display area shipments may change in the future, but we see no evidence of such change to date.



BizWitz

—David Barnes for BizWitz LLC, a consultancy specializing in electronic display and imaging business decisions through the supply chain from raw materials through retail, worldwide