



HENDERSON

ELECTRONIC MARKET FORECAST QUARTERLY

MANAGEMENT PERSPECTIVES

FIRST QUARTER 2016

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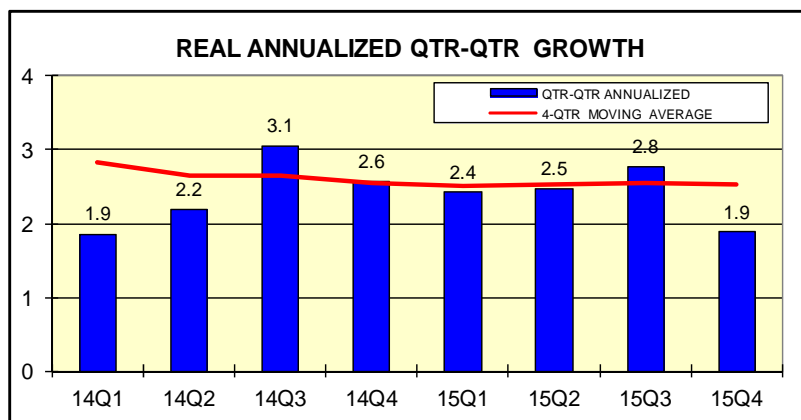
1. MANAGEMENT PERSPECTIVES

1.1 ECONOMIC ANALYSIS

FOURTH-QUARTER RESULTS LAND WITH A THUD

Hopes for a rapid global economic rebound have been put on hold, again. The fourth-quarter statistics showed that the annualized rate of GDP growth decelerated from a 2.8 percent pace in the third quarter to a feeble 1.9 percent gain in the fourth quarter. Last quarter's results were the weakest since an identical statistic was posted for the first quarter of 2014, as shown in Figure 1.1.1. The growth-rate anemia was widespread. The US posted only a 1.0 percent gain, which was duplicated by Europe. Asia, however, turned in a more-buoyant 3.5 percent bump, which was largely driven by China (6.6 percent) and India (4.4. percent). The Asian results may have been far worse if, as suspected, China is publishing inflated results; i.e. cooking the books.

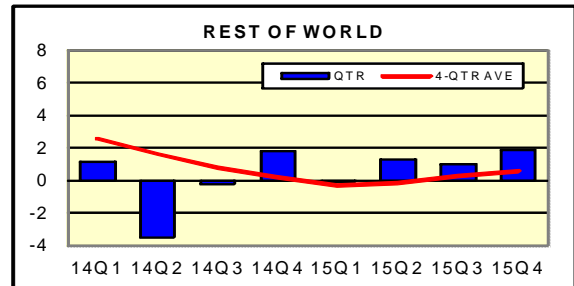
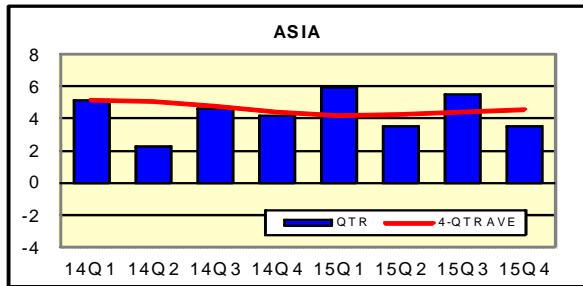
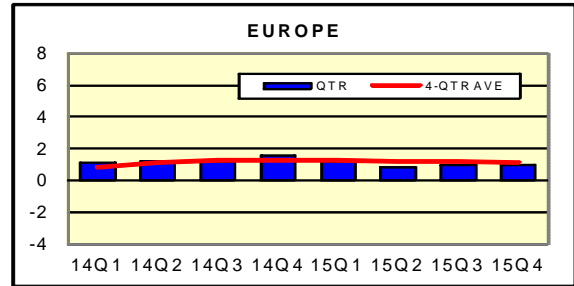
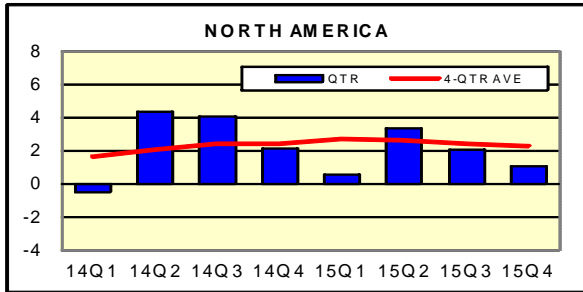
FIGURE 1.1.1
GLOBAL GROSS DOMESTIC PRODUCT



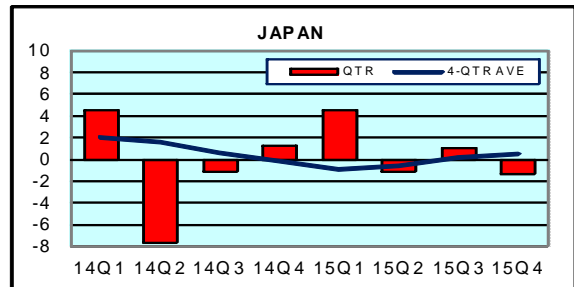
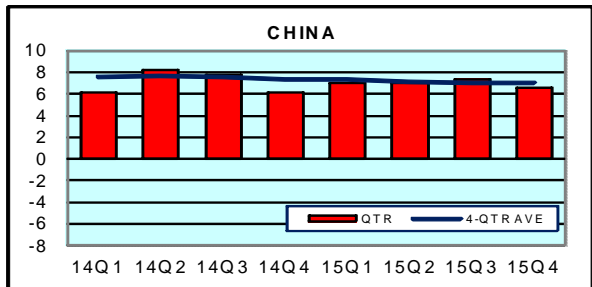
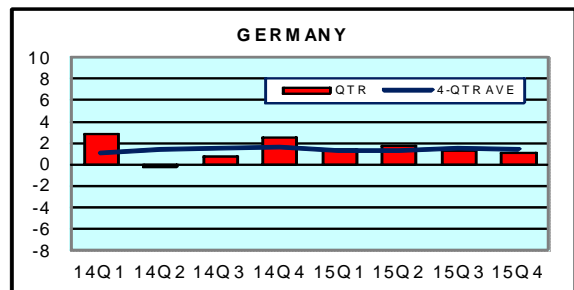
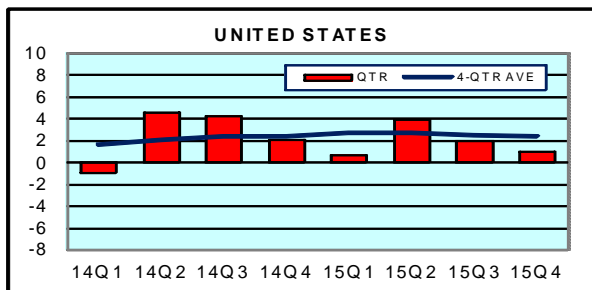
A FEW ECONOMIC SPARKS

While China and India turned in solid results, there were a few other buoyant gains worth noting. In particular, Sweden was ahead by 5.3 percent, Spain continued to turn in respectable post-recession growth as evidenced by a 3.3 percent gain. And East Europe continued to prosper. Poland surged by 4.5 percent, Hungary was up by 4.1 percent and Slovakia gained 5.3 percent. But those fast-growing eastern European countries had insufficient heft to significantly raise the overall level of economic activity on the Continent. The results for key regions and countries are shown in Figure 1.1.2. Perhaps more disturbing than the disappointing fourth quarter world results is the fact that the 4-quarter moving average growth rates, which smooth the volatility of the quarterly results, highlight the fact that the global economy has been essentially stuck at a 2.5 percent annual growth rate since the fourth quarter of 2014, as illustrated above.

FIGURE 1.1.2
GLOBAL ECONOMIC PERFORMANCE
Real Annualized Quarter-To-Quarter Growth Rates



CATEGORY	13Q3	13Q4	14Q1	14Q2	14Q3	14Q4	15Q1	15Q2	15Q3	15Q4
WORLD	3.4	2.9	1.9	2.2	3.1	2.6	2.4	2.5	2.8	1.9
NORTH AMERICA	3.1	3.6	-0.5	4.4	4.0	2.1	0.6	3.4	2.1	1.1
EUROPE	1.7	1.2	1.1	1.2	1.2	1.5	1.2	0.8	1.0	1.0
ASIA	6.0	4.3	5.2	2.3	4.6	4.2	5.9	3.5	5.5	3.5
REST OF WORLD	1.3	0.6	1.2	-3.5	-0.2	1.8	0.0	1.3	1.0	1.9
UNITED STATES	3.0	3.8	-0.9	4.6	4.3	2.1	0.6	3.9	2.0	1.0
GERMANY	1.5	1.3	2.9	-0.2	0.8	2.5	1.4	1.8	1.3	1.1
CHINA	9.5	7.0	6.1	8.2	7.8	6.1	7.0	7.0	7.4	6.6
JAPAN	2.5	-0.9	4.5	-7.6	-1.1	1.3	4.5	-1.2	1.0	-1.4



THE RATIONALE FOR HEIGHTENED INFLATION

Although the results have been disappointing, the global economy has been on the mend for about six years. During the early years of the recovery, a combination of expansive fiscal and monetary policies supported economic activity, but inflation hawks across the globe resisted additional aggressive deficit spending policies after the economies appeared to have perked up after the subsidy-fueled gains during 2010. But not before national debt had taken off. For example, public debt in the US rose from 64 percent of GDP in 2008 to 104 percent last year. Similarly, Europe went from 66 percent to 93 percent and Japan's debt has continued to soar. The 176 percent of GDP in 2010 rose to an amazing 237 percent in 2015.

When the debt police hit the brakes, it was left to monetary authorities to prime the pump. However, as central banks administered near-zero interest rates, the strategy did not create as much borrowing and spending as had been hoped. Moreover, in the wake of the bank bailouts, financial institutions were required to increase their core capital to guard against a future collapse of the financial infrastructure. Many banks sold equity to achieve the desired levels of fire-break capital. But they were also saddled with bad debts, much of which was unrecognized. Consequently, profits were also used to bulk up core capital.

Lending standards were also tightened, which had the counterproductive effect of hobbling consumer spending and business investment. And because low interest rates were not having the desired effect, central banks began to embark on a strategy of quantitative easing (QE), which effectively flooded the market with cash. The cash injection was facilitated by central bank purchases of bonds issued by government entities and private debt instruments. Unfortunately, QE did not seem to have the impact hoped for either. Consequently, some banks are now experimenting with negative interest rates. That is depositors have to pay a fraction of 1 percent for the privilege of parking their funds at financial institutions. The hope is that consumers and corporations faced with declining account balances will opt for more aggressive consumption and investment spending.

In effect, negative interest rates constitute synthetic inflation. Traditional inflation is defined in terms of price increases that effectively encourage a buyer to purchase goods today before prices go up tomorrow. Similarly, a bank customer who faces the prospect of declining balances is also incentivized to purchase now. A greater portion of his or her wealth will be required for a delayed purchase even if prices remain stagnant.

DEFLATION MAY BE ON THE RUN

In effect, central banks have been trying to perk up the global economy by making cash more readily available to help pump up the rate of inflation. As noted above, inflation encourages consumer and business spending. In contrast, deflation, which entails falling prices, discourages current outlays because goods and services can be purchased at a lower price in the future. It also makes it harder for homeowners and other debtors to repay their loans, which reinforces the resistance to consumption and investment spending. Contracting prices and spending cuts constitute a vicious cycle of falling or stagnant economic activity that economists call a "liquidity trap." Japan has found itself so snared during the last two decades. Near-zero inflation

has been accompanied by an inert economy. The Japanese experience shows that inflation rates do not have to be negative before the damage is done. Economic analysis of decades' worth of statistics has convinced central bankers that an inflation rate of about 2 percent is the policy sweet spot that encourages spending while leaving sufficient maneuvering room should another recession rear its ugly head.

And whereas monetary policy makers have been unsuccessful over the past five plus years to achieve their 2 percent goal, recent statistics suggest that the Holy Grail may shortly be within reach. January data for the UK revealed that core inflation, which excludes energy and food, was up 1.2 percent on a year-to-year basis. That represents an acceleration from the 0.8 percent increase recorded last June. Similarly, Japanese core inflation rose to 0.8 percent in December from 0.4 percent in April. The Eurozone registered a 1.2 percent increase in January, and the US posted a 2.2 percent increase. And given that energy prices are not likely to fall much further, the deflationary force they exerted over the past 1-2 years will soon wash out of the year-to-year statistics. Moreover, oil and gas prices can be expected to rise within a year or two, if not before. The recent inflation statistics suggest that the 2 percent goal *may* be in the offing.

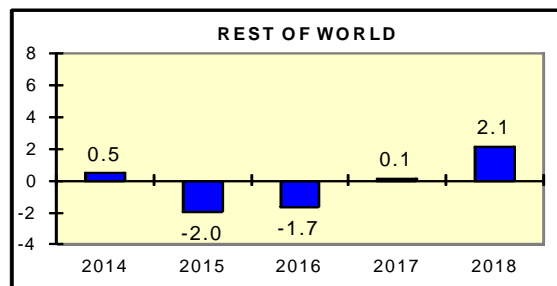
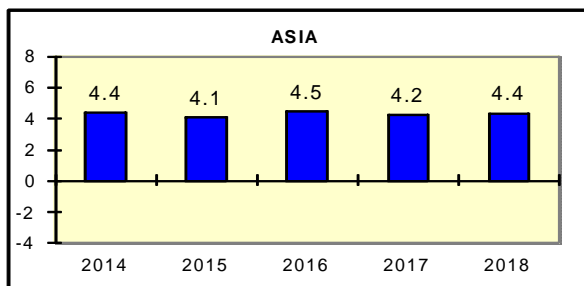
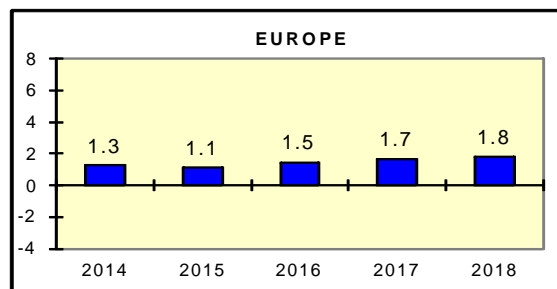
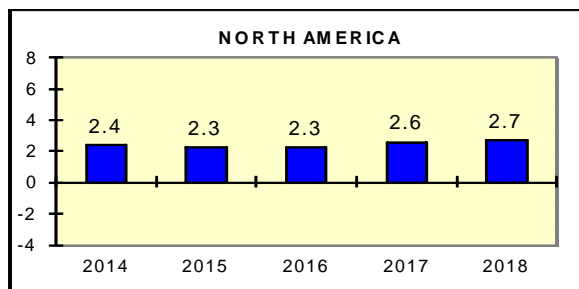
ENCOURAGING SIGNS FOR THE US ECONOMY

Despite the fact that the fourth-quarter statistics showed that the US economy grew at a measly 1.0 percent annualized rate, data for January present a much improved picture. That is, consumer spending grew at the fastest pace in eight months. The gains were propelled by robust wage increases. An additional 242,000 jobs were created in February, suggesting further GDP gains in the months ahead. Consumption spending is being helped along by the massive declines in oil prices. The price for West Texas Intermediate (WTI) averaged \$27/barrel in February, which was down from the 2014 high of \$93/bbl. But falling oil prices, while a net economic positive, is a mixed blessing. Energy-related industries have sharply curtailed investment. The oil patch cutback has contributed substantially to the 0.7 percent annualized decline in US gross private domestic investment in each of the last two quarters of 2015. And a strong dollar, along with weak international economies, created a 2.7 percent annualized decline in exports during the final quarter of last year. Those negative forces, along with a depressed fourth-quarter result, constitute the combination of economic headwinds and a low starting position for 2016 gains.

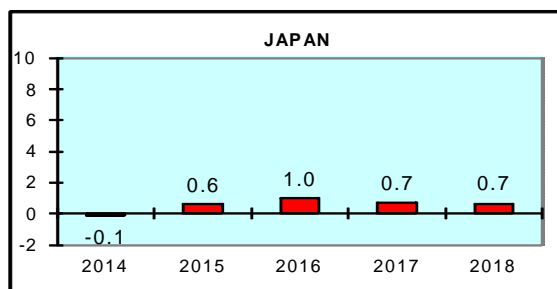
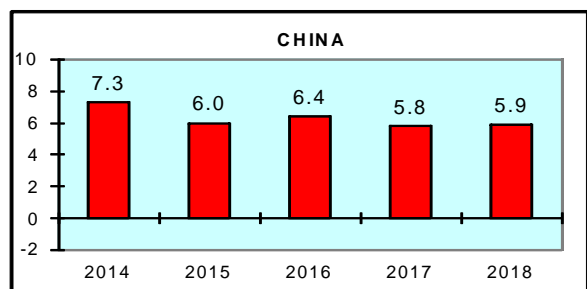
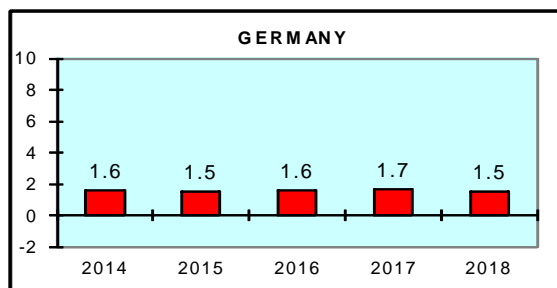
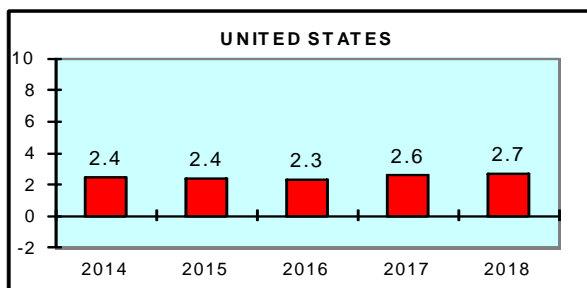
In fact, US GDP is actually predicted to slip from a 2.4 percent rate of growth in 2015 to 2.3 percent this year, despite a forecast of substantial quarter-to-quarter gains during the course of the year. But heartier results are predicted to unfold during the next few years, leading to a 2.7 percent expansion in 2018, as shown in Figure 1.1.3.

And although the current political environment is not conducive to an increase in the gas tax, it may have a chance next year. US drivers are being saddled with what is effectively a hidden tax on their vehicles. That is, TRIP, a transportation think tank, found that poor road conditions in 25 American cities were pushing the annual car maintenance costs up by \$700 per vehicle per year. In contrast, a ten cents per gallon gas tax increase would cost a driver of a 20-mile per gallon car only \$50 extra if he or she drove 10,000 miles per year. The increased tax would take care of road maintenance shortfalls within 5-7 years.

FIGURE 1.1.3
GLOBAL ECONOMIC FORECAST
Real Annual Growth Rates



CATEGORY	13Q3	13Q4	14Q1	14Q2	14Q3	14Q4	15Q1	15Q2	15Q3	15Q4
WORLD	3.4	2.9	1.9	2.2	3.1	2.6	2.4	2.5	2.8	1.9
NORTH AMERICA	3.1	3.6	-0.5	4.4	4.0	2.1	0.6	3.4	2.1	1.1
EUROPE	1.7	1.2	1.1	1.2	1.2	1.5	1.2	0.8	1.0	1.0
ASIA	6.0	4.3	5.2	2.3	4.6	4.2	5.9	3.5	5.5	3.5
REST OF WORLD	1.3	0.6	1.2	-3.5	-0.2	1.8	0.0	1.3	1.0	1.9
UNITED STATES	3.0	3.8	-0.9	4.6	4.3	2.1	0.6	3.9	2.0	1.0
GERMANY	1.5	1.3	2.9	-0.2	0.8	2.5	1.4	1.8	1.3	1.1
CHINA	9.5	7.0	6.1	8.2	7.8	6.1	7.0	7.0	7.4	6.6
JAPAN	2.5	-0.9	4.5	-7.6	-1.1	1.3	4.5	-1.2	1.0	-1.4



EUROPE STILL FACES DAUNTING CHALLENGES

As noted at the opening, the European economy managed only a 1.0 percent gain during the fourth quarter. While that was the same as the US, European quarterly growth rates have not been above 1.5 percent during the last two years, versus US growth rates that had been as high as 4.6 percent. Moreover, whereas the US is largely self-sufficient economically, Europe depends on exports for a far greater portion of its economic activity. That's particularly true of German exporters who rely on emerging economies for purchases of machine tools and other industrial goods that Germany specializes in.

Given the continued sluggishness of the economy, the European Central Bank (ECB) is expected to announce stepped up monetary stimulus at its March 10th meeting. The ECB's implementation of more muscular QE support will be accompanied by the aforementioned negative interest rates now in force at some European banks. But negative interest rates push down bank profits, thereby undermining the core capital requirements that they are attempting to bolster.

Moreover, the European banking industry as a whole is weighed down by bad loans, which have grown in recent years. Italian firms have suffered as well as the banks that have lent to them. Gross nonperforming loans now amount to 360 billion euros, 18 percent of which are thought to be especially risky. Consequently, small firms, of which Italy abounds, are finding it difficult to borrow. This absence of liquidity has pummeled the Italian economy, which in 2015 was 9 percent lower than it was in early 2008.

Italy is, perhaps, an extreme example of the Continent's problems. Recessions have plagued the country for five of the past eight years. Labor productivity has fallen for more than two decades. Taxes and red tape create friction, particularly for companies that employ more than 50 workers. Consequently, about 70 percent of Italian workers are employed by small firms, which are fundamentally inefficient. Moreover, they find it difficult to secure loans from a risk-adverse banking industry that continues to husband its capital.

Italy's labor problems are intertwined with a socio-political environment that favors entrenched entities. Moreover, politics are becoming an even greater problem for Europe as a whole. Fear of terrorism and the deluge of immigrants coming to Europe have created additional challenges. A growing number of countries are essentially closing their borders to new refugees. Border checks are becoming more prevalent, which threatens the Schengen Agreement that facilitates the free flow of people and commerce among member countries. The re-establishment of border checks would create additional economic friction and reduce GDP potential throughout Europe.

For example, almost 2 million Europeans commute daily between countries to go to work. The pain would be the greatest for exporters attempting to truck their loads through a series of border crossings.

The combination of terrorism threats and massive immigration has fueled populous fear and resentment that has enlarged the population of euro skeptics. And the threat presented by anti-EU voters is coming into sharp focus as Britain prepares for a May referendum on continued membership in the European Union.

A “No” vote by the second-largest economy in Europe would greatly disrupt the current economic order including trade agreements, shared resources and defense policy. Moreover, it would perhaps encourage other doubter countries to also withdraw with the possible collapse of the entire EU structure. Either way, there would be a major economic shock that can only retard economic progress.

Even if Britain remains a EU member, the outlook is not bright without a reduction of stifling regulations and liberalization of the labor market. Failing that, there will be a continuation of growth rates that will not reach 2 percent throughout the forecast period. The average annual growth rate between 2015 and 2020 will be only 1.6 percent. Only Poland and the Slovak Republic are expected to achieve growth rates in excess of 3 percent over the forecast period.

ASIA HAS SLOWED

The Asian economies, which posted a 5.5 percent annualized rate of growth during the third quarter of last year, slowed markedly to 3.5 percent in the final period of 2015. Japan may be falling back into recession given the 1.4 percent decline during the fourth quarter. While Taiwan and Singapore perked up during the final period, all other major economies slowed. That included China, which decelerated to a 6.6 percent pace after an alleged 7.4 percent gain during the third quarter, as shown in Table 1.1.1. And India fell from a hyper-drive 11.9 percent pace to 4.4 percent in the fourth quarter. It is well known that the Asian slowdown has been precipitated by a like trajectory for the Chinese economy as it attempts to rebalance its economy away from investment and manufacturing to consumption of goods and services. A drawdown of excess manufacturing capacity is creating dislocations not only for China but its trading partners. The problem is exacerbated by a massive inventory cycle. That is, not only are imports shrinking, but the huge levels of excess inventories are undergoing even sharper reductions. That translates to magnified market contractions for not only material suppliers but companies all up and down the supply chain, including suppliers of production equipment.

To help ease the ongoing structural transition, the People’s Bank of China (PBOC) has lowered the reserve requirements that banks must hold by a half percentage point. But that might worsen the problem long term because companies with excess capacity and falling profits are taking on more debt to pay off existing loans. That amounts to an unsustainable Ponzi scheme.

The obvious solution is to consolidate firms and reduce capacity. The excess capacity that is currently plaguing the country in both manufacturing and real estate is evident in the gap between production and capacity that has mushroomed over the last eight years. The so-called output gap was approximately zero in 2007. It grew to over 13 percent last year. This excess capacity has resulted in falling prices and the emergence of profitless zombies. Yet local governments who either own the firms or depend on their revenues for taxes resist consolidation. The magnitude of the problem is brought into sharp focus by noting that Provincial governments control most of the country’s 150,000 publicly-owned firms. The monetary and fiscal stimuli being applied to the economy is predicted to result in a 6.4 percent economic gain this year after an unofficial estimate of 6.0 percent for last year. But the country is likely to see a continued deceleration through 2019 when a 5.5 percent advance is expected.

TABLE 1.1.1
ANNUALIZED RATES OF REAL QUARTER-TO-QUARTER ECONOMIC GROWTH

	13Q4	14Q1	14Q2	14Q3	14Q4	15Q1	15Q2	15Q3	15Q4
WORLD TOTAL	2.9	1.9	2.2	3.1	2.6	2.4	2.5	2.8	1.9
NORTH AMERICA	3.6	-0.5	4.4	4.0	2.1	0.6	3.4	2.1	1.1
UNITED STATES	3.8	-0.9	4.6	4.3	2.1	0.6	3.9	2.0	1.0
CANADA	2.9	1.0	3.4	3.2	2.2	-0.8	-0.5	2.3	0.8
MEXICO	1.3	2.0	3.2	2.4	2.8	1.7	2.0	3.0	2.2
EUROPE	1.2	1.1	1.2	1.2	1.5	1.2	0.8	1.0	1.0
GERMANY	1.3	2.9	-0.2	0.8	2.5	1.4	1.8	1.3	1.1
FRANCE	0.7	-0.7	-0.5	1.2	0.4	2.7	0.0	1.0	1.4
UNITED KINGDOM	2.6	2.5	3.8	2.6	3.0	1.5	2.6	1.8	1.9
ITALY	0.0	-0.9	-0.6	-0.2	-0.1	1.5	1.2	0.8	0.4
SWEDEN	3.4	2.2	2.6	1.2	4.9	2.4	4.8	3.4	5.3
NORWAY	-1.4	2.3	4.6	1.6	3.4	0.3	-0.4	7.3	-4.7
DENMARK	0.8	0.7	0.8	2.7	1.3	2.4	0.6	-1.8	1.0
FINLAND	-1.2	-1.8	0.7	-0.2	-0.5	0.1	-2.4	1.0	0.5
NETHERLANDS	2.1	-1.5	2.2	1.8	3.8	2.6	0.8	0.6	1.0
BELGIUM	0.6	1.6	0.4	1.3	0.9	1.4	1.7	0.9	1.3
SPAIN	1.1	1.2	2.1	2.1	2.7	3.8	4.0	3.2	3.3
PORTUGAL	3.9	-1.6	1.0	1.0	2.2	1.5	2.2	0.0	0.9
GREECE	-2.9	-0.3	0.4	1.6	-1.5	-0.7	3.7	-3.5	0.5
SWITZERLAND (b)	2.0	2.1	0.5	2.4	2.9	-0.9	1.0	-0.1	-0.1
AUSTRIA	1.3	1.2	-1.0	0.0	-0.8	2.9	0.6	1.9	3.7
IRELAND (b)	-5.6	6.9	4.8	8.6	4.2	8.8	7.7	5.6	5.6
CZECH REPUBLIC (b)	4.5	2.6	0.7	1.6	11.7	3.6	4.4	-0.4	-0.4
POLAND	2.9	4.2	2.9	3.7	3.1	4.1	3.6	3.6	4.5
HUNGARY	4.0	2.5	4.2	1.7	3.2	3.1	2.0	2.3	4.1
SLOVAK REPUBLIC	2.0	3.2	2.9	1.6	2.3	6.1	3.2	3.5	5.3
RUSSIA (a)	1.3	0.6	1.5	-1.3	-2.7	-6.1	-7.8	-4.1	-4.1
ASIA	4.3	5.2	2.3	4.6	4.2	5.9	3.5	5.5	3.5
CHINA	7.0	6.1	8.2	7.8	6.1	7.0	7.0	7.4	6.6
JAPAN	-0.9	4.5	-7.6	-1.1	1.3	4.5	-1.2	1.0	-1.4
SOUTH KOREA	3.5	4.4	2.0	3.2	1.1	3.3	1.3	5.3	2.3
TAIWAN	7.6	1.1	4.2	2.1	4.8	2.7	-6.6	-1.2	2.2
SINGAPORE	6.9	1.9	-0.3	3.1	4.9	3.2	-4.0	1.9	6.2
HONG KONG	4.6	0.6	0.2	5.4	1.5	1.5	1.6	3.5	0.9
THAILAND	0.1	-2.7	0.1	4.7	7.1	7.1	1.5	4.0	3.2
INDIA	8.1	6.6	7.4	8.9	5.3	8.2	6.6	11.9	4.4
MALAYSIA (a)	6.8	5.5	6.2	3.8	4.7	5.2	4.9	4.7	4.5
REST OF WORLD	0.6	1.2	-3.5	-0.2	1.8	0.0	1.3	1.0	1.9
BRAZIL (b)	0.3	2.6	-5.4	0.6	1.3	-0.6	-7.2	-6.7	-6.7
ARGENTINA (b)	-1.8	-3.9	0.3	-5.8	0.1	0.8	2.0	1.0	2.0
ISRAEL	2.6	3.2	2.2	-0.4	6.8	2.0	0.1	2.0	3.3
SOUTH AFRICA	5.1	-1.6	0.5	2.1	4.1	1.3	-1.3	0.7	0.6

(a) Year-to-year Growth Rates

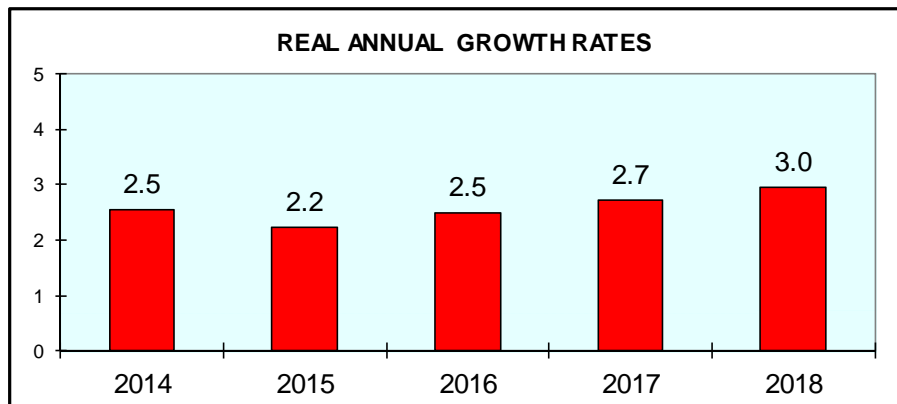
(b) 15Q4 Data are estimates

MORE DOWNSIDE RISK THAN UPSIDE

Our forecast somewhat optimistically calls for China to maintain solid growth rates through the decade, even though double-digit gains will never reappear. The GDP projections are much the same as those that we previously published, but now they are closer to the official target announced on March 4th. Policy officials now expect growth in the 6.5-7.0 percent range. But financial missteps could very well precipitate a full-blown recession. And the global forecast is subject to an array of socio-political uncertainties including a partial breakup of the EU, a wider war in the Mideast and a military confrontation with North Korea.

And with all due respect for frustrated US voters on both the right and the left, the results of the November election could result in some tragic policy decisions should a President Trump pursue some of his wilder strategies professed on the campaign trail. For example, implementation of big tariff increases on China and Mexico could precipitate a trade war with devastating consequences as the Smoot-Hawley legislation of 1930 showed. Notwithstanding the risks, our economic forecast calls for a gradual acceleration of global economic growth to 3.0 percent in 2018, as illustrated in Figure 1.1.4. A regional breakdown appears in Table 1.1.2.

FIGURE 1.1.4
GLOBAL GROSS DOMESTIC PRODUCT



GLOBAL PURCHASING MANAGERS INDEX GOES FLAT

After a 50.9 percent reading in January, the February global Purchasing Managers Index (PMI) slipped to 50.0, as shown in Figure 1.1.5. That indicates that the global manufacturing industry was neither expanding nor contracting. That it wasn't contracting is of some consolation, but not much. Given our previous discussions it will probably not come as a surprise that the weakest link in the supply chain can be found in China. The PMI slipped from 48.4 percent in January to 48.0 in February. Unfortunately, the US measure was also underwater. However, it did increase from 48.2 in January to 49.5 in February. More muscular reports were turned in by Mexico: 52.2, Spain: 54.2, Ireland: 52.9, Italy: 52.2 and Poland: 52.8. The booby prize went to, no surprise, Brazil, which fell from 47.4 in January to 44.5 in February.

**FIGURE 1.1.5
GLOBAL FACTORY ACTIVITY**



**TABLE 1.1.2
ANNUAL RATES OF REAL ECONOMIC GROWTH**

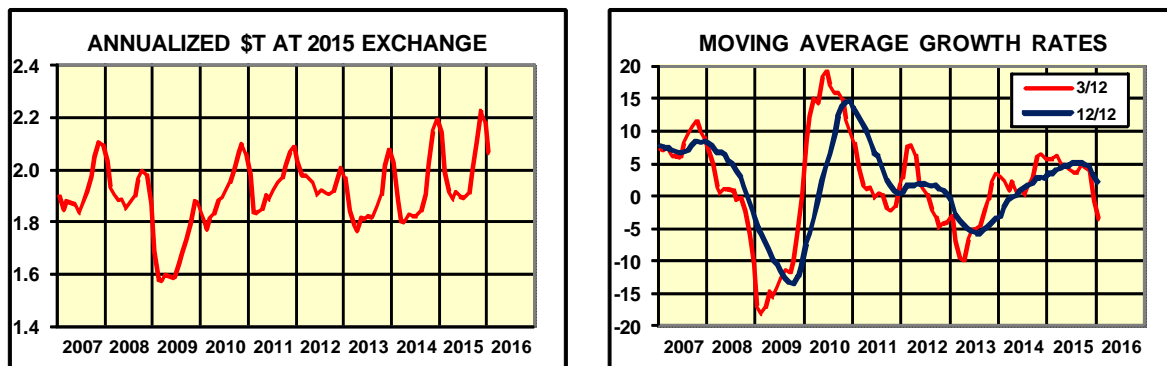
	2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD TOTAL	2.3	2.5	2.2	2.5	2.7	3.0	2.5	3.0	2.7
NORTH AMERICA	1.5	2.4	2.3	2.3	2.6	2.7	2.3	2.5	2.5
UNITED STATES	1.5	2.4	2.4	2.3	2.6	2.7	2.2	2.5	2.5
CANADA	2.0	2.4	1.2	1.7	2.2	2.3	2.1	2.0	2.1
MEXICO	1.4	2.1	2.2	2.8	3.1	3.2	3.3	3.3	3.2
EUROPE	0.3	1.3	1.1	1.5	1.7	1.8	1.4	1.8	1.6
GERMANY	0.4	1.6	1.5	1.6	1.7	1.5	1.1	1.3	1.4
FRANCE	0.7	0.2	1.1	1.2	1.4	1.7	1.2	1.9	1.5
UNITED KINGDOM	1.7	3.0	2.2	2.0	2.2	2.2	1.4	2.1	2.0
ITALY	-1.7	-0.4	0.7	1.1	1.2	1.1	0.8	1.0	1.0
SWEDEN	1.3	2.1	3.3	3.0	2.5	2.5	1.4	2.3	2.4
NORWAY	0.7	2.2	0.8	1.3	1.6	1.9	1.6	2.0	1.7
DENMARK	-0.5	1.1	1.4	1.6	2.1	2.2	2.0	2.2	2.0
FINLAND	-1.1	-0.4	0.3	1.0	1.2	1.3	1.0	1.6	1.2
NETHERLANDS	-0.5	1.0	2.0	1.7	1.9	1.9	2.0	2.1	1.9
BELGIUM	0.3	1.1	1.3	1.3	1.5	1.5	1.5	1.5	1.5
SPAIN	-1.2	1.4	3.2	2.5	2.0	2.0	1.6	1.8	2.0
PORTUGAL	-1.6	0.9	1.4	1.6	1.4	1.3	1.2	1.2	1.3
GREECE	-3.9	0.8	0.3	1.5	2.7	3.1	2.8	2.4	2.5
SWITZERLAND	1.8	1.9	0.8	1.3	1.4	1.9	1.5	1.9	1.6
AUSTRIA	0.3	0.4	0.8	1.3	1.3	1.2	1.1	1.1	1.2
IRELAND	1.4	5.2	3.5	3.2	3.2	3.0	2.7	2.5	2.9
CZECH REPUBLIC	-0.5	2.0	3.6	2.8	2.6	2.2	2.2	2.2	2.4
POLAND	1.7	3.4	3.4	3.3	3.2	3.6	3.6	3.6	3.4
HUNGARY	1.5	3.6	2.9	2.6	2.3	2.1	2.1	2.1	2.2
SLOVAK REPUBLIC	1.4	2.4	2.9	2.7	3.4	3.3	3.1	3.1	3.1
RUSSIA	1.3	0.6	-3.8	-1.0	0.6	1.5	1.5	1.5	0.8
ASIA	4.9	4.4	4.1	4.5	4.2	4.4	3.8	4.7	4.3
CHINA	7.7	7.3	6.0	6.4	5.8	5.9	5.5	6.3	6.0
JAPAN	1.6	-0.1	0.6	1.0	0.7	0.7	0.4	0.7	0.7
SOUTH KOREA	2.9	3.3	2.6	2.7	3.0	3.6	2.5	3.6	3.1
TAIWAN	2.2	3.8	2.9	2.5	2.8	3.1	2.0	3.2	2.7
SINGAPORE	4.4	2.9	2.7	2.9	3.0	3.2	2.1	3.2	2.9
HONG KONG	3.1	2.5	2.4	2.1	2.8	2.9	2.1	3.3	2.6
THAILAND	2.8	0.9	3.3	3.8	3.6	3.4	3.0	3.2	3.4
INDIA	6.9	7.3	7.2	7.4	7.5	7.6	5.8	7.7	7.2
MALAYSIA	4.7	6.0	5.2	5.4	5.6	5.0	4.5	5.0	5.1
REST OF WORLD	2.7	0.5	-2.0	-1.7	0.1	2.1	1.8	2.2	0.9
BRAZIL	2.7	0.1	-3.7	-3.0	-0.6	2.4	2.0	2.5	0.6
ARGENTINA	2.9	0.5	1.0	-0.4	0.0	0.1	0.2	0.2	0.0
ISRAEL	3.3	2.6	3.2	3.7	3.5	3.0	2.5	2.9	3.1
SOUTH AFRICA	2.2	1.5	1.3	1.0	2.1	2.5	2.0	2.6	2.0

1.2 WORLD EQUIPMENT PROSPECTS

EQUIPMENT OUTPUT IS SINKING

World production of electronic equipment came in at \$2.06 trillion in January, as shown on the left side of Figure 1.2.1. It should be noted that the data have significantly changed due to historical revisions and our switch to a 2015 constant-exchange rate benchmark versus the 2014 anchor used last month and earlier. The change to 2015 exchange rates lopped off roughly \$200 billion worth of production value for December 2015. The severe reduction was caused by a large increase in the value of the US dollar during 2015. As a result, non-US output was greatly reduced in 2015 because production values outside the US were worth less when converted to US dollars at 2015 exchange rates. That said, the 3/12 and 12/12 growth rates illustrated in the right chart have changed little. The switch to 2015 exchange rates essentially scales back the historical values but retains the year-to-year patterns.

FIGURE 1.2.1
WORLD ELECTRONIC EQUIPMENT PRODUCTION



Sources include: Custer Consulting Group and Henderson Ventures

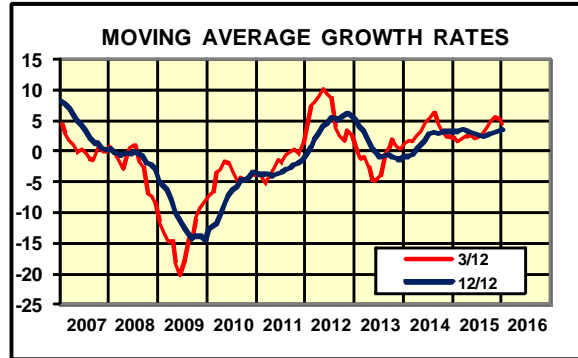
CHINA TANKED IN JANUARY

The monthly production patterns for the three major countries/regions are illustrated in Figure 1.2.2. The US spent 2015 regaining some of the lost ground of 2014. By year-end the 3/12 growth rate was 5.3 percent on the strength of an annualized production value of \$352 billion, as illustrated in the top-left chart of Figure 1.2.2. The January 3/12 growth rate was 4.3 percent. The 12/12 expansion rate was 3.4 percent, as shown in the top-right chart of Figure 1.2.2.

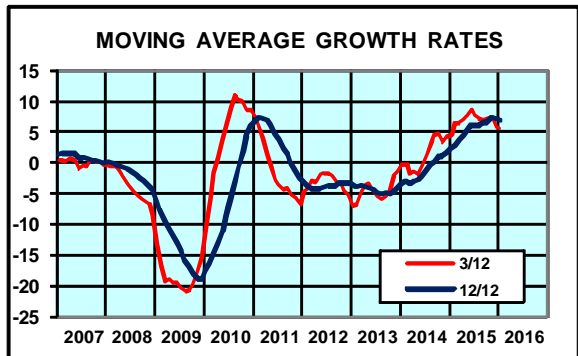
The depressed value of the euro allowed West European electronic equipment manufacturers to raise their game during 2015. The January 2016 value of output was \$386 billion, which was the highest level of production reached since early 2011, as shown in the middle-left chart of Figure 1.2.2. But economic fundamentals, including the slowing Asian demand for European cars and production equipment, have begun to take its toll. The rolloff in output values has been accompanied by a gradual depletion of year-to-year growth rates. The 3/12 expansion rate fell from a peak of 8.6 percent during mid-2015 to a January 2016 value of 5.5 percent. The 12/12 growth rate has also begun to subside. The January reading was 6.8 percent.

FIGURE 1.2.2
REGIONAL EQUIPMENT PRODUCTION
 Data Converted to US Dollars at Constant Exchange Rates

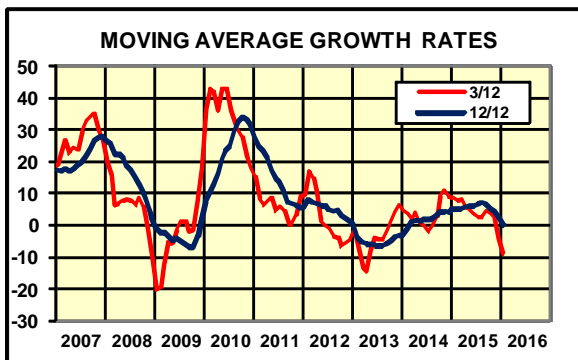
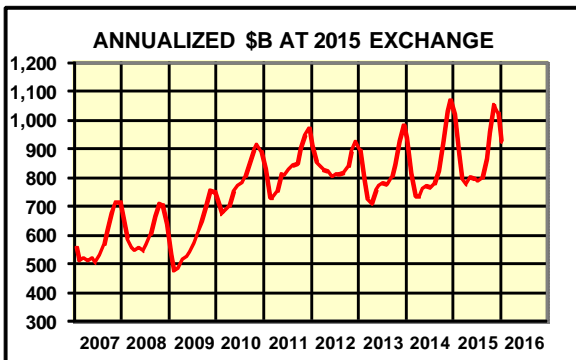
US ELECTRONIC EQUIPMENT PRODUCTION



EUROPEAN ELECTRONIC EQUIPMENT PRODUCTION



CHINA PLUS TAIWAN ELECTRONIC EQUIPMENT PRODUCTION



The biggest surprise in the January equipment statistics was not that China's output declined during the opening month of 2016, but the plunge in the 3/12 growth rates, which automatically subtract out seasonal factors. The 3/12 expansion rate came in at -8.9 percent, as shown in the bottom-right chart of Figure 1.2.2. Statistics for the opening months of the year are usually problematic because Chinese New Year is always between January 21st and February 20th. The Year of the Monkey began on Monday, February 8, 2016. Therefore, a week-long celebration should not have impacted the January statistics. Consequently, it is unclear what is in play for 2016. However, the January data do not bode well for current production. It will not be until the February data become available that a thorough assessment can be made.

POOR REVENUE RESULTS CONTINUE IN THE FOURTH QUARTER

During the fourth quarter the year-to-year revenue growth was -6.6 percent for the 175 Corporations tracked by Custer Consulting, as shown in the right chart of Figure 1.2.3. Year-to-year changes have been in negative territory ever since the first quarter when a 0.6 percent decline was posted. On a 4-quarter moving average basis, sales were down 4.3 percent, which corresponds to the results for the year. Revenue during the fourth quarter came in at an annualized basis of \$2.53 trillion, as shown in the left chart.

It is emphasized that the data illustrated for the 175 equipment companies are based on fluctuating exchange rates. Therefore, the results are substantially worse than the growth rates that were illustrated in the right chart of Figure 1.2.1, which were based on constant 2015 exchange rates.

As might be expected, the thirteen computer equipment manufacturers turned in the worst performance for the fourth quarter and for the year. As will be discussed shortly, personal computer (PC) demand has withered. Manufacturers conducting sales in US dollars were forced to raise prices in order to either minimize losses or salvage some profitability during the year as in-country currencies plunged.

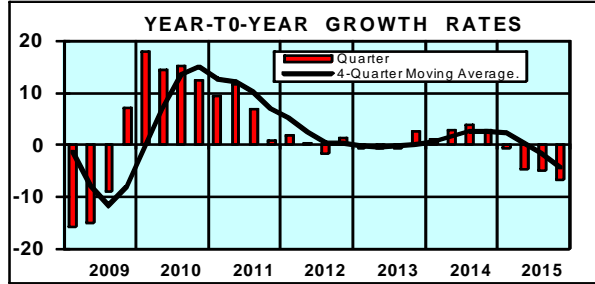
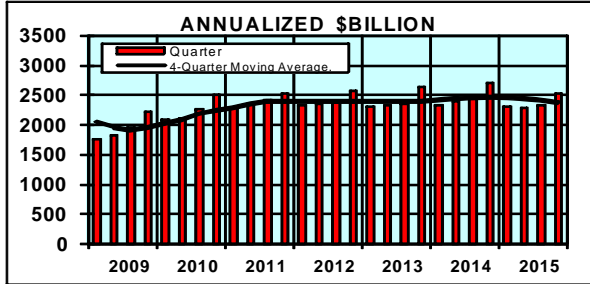
Moreover, corporations are still in the process of evaluating Windows 10 software from Microsoft. Therefore, it will not be until late this year that companies begin a large refresh cycle driven by acceptance of Win 10. That said, revenues for the fourth quarter were 7.3 percent lower than the same period in 2014, as illustrated by the year-to-year growth rates. The 4-quarter moving average came in a -7.7 percent, which corresponds to the plunge in sales for 2015 overall.

Our sample of 20 communication companies did *relatively* well. Sales during the fourth quarter were down only 2.6 percent. The 4-quarter moving average salvaged a 7.4 percent gain, partially on the strength of expanding network buildouts.

The damage in the 63 Industrial & Instruments space included shallow quarterly dips for all four periods in 2015. Sales during the final period were down 3.5 percent, which closely approximated the 4-quarter moving average, as shown in the bottom-right chart of Figure 1.2.3.

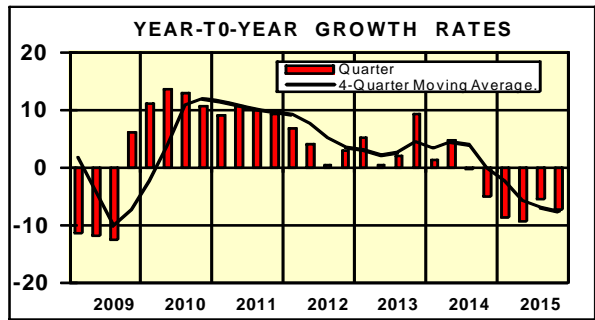
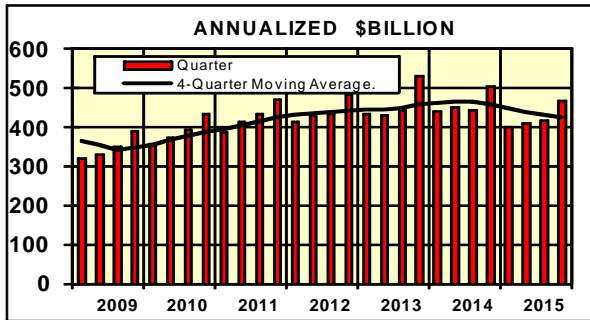
FIGURE 1.2.3
PUBLIC CORPORATION REVENUES
 Data Converted at Fluctuating Exchange Rates

175 EQUIPMENT COMPANIES



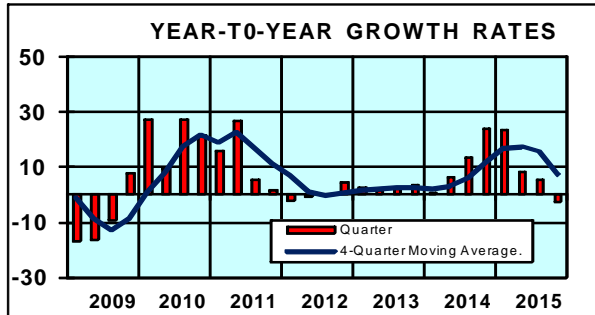
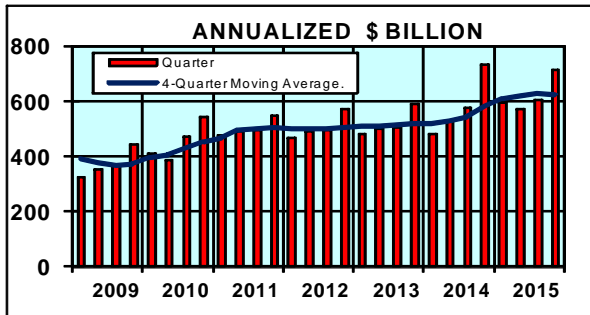
Source: Custer Consulting & Financial Reports

13 COMPUTER COMPANIES



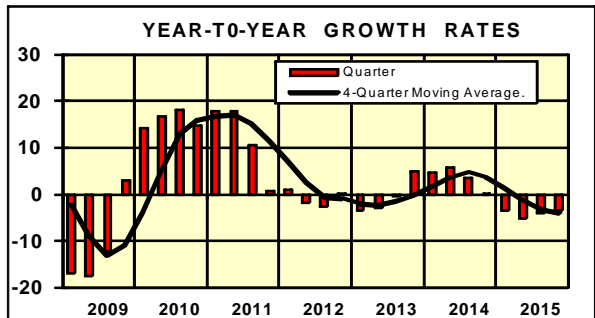
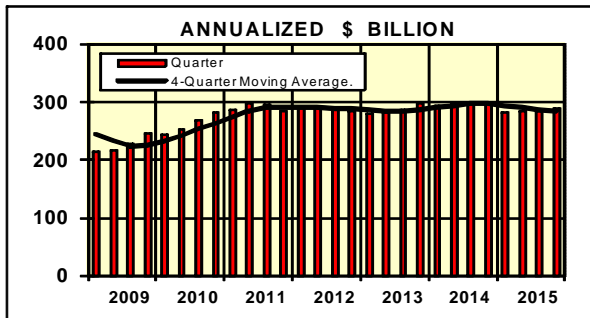
Source: Custer Consulting & Financial Reports

20 COMMUNICATIONS COMPANIES



Source: Custer Consulting & Financial Reports

63 INDUSTRIAL & INSTRUMENT COMPANIES

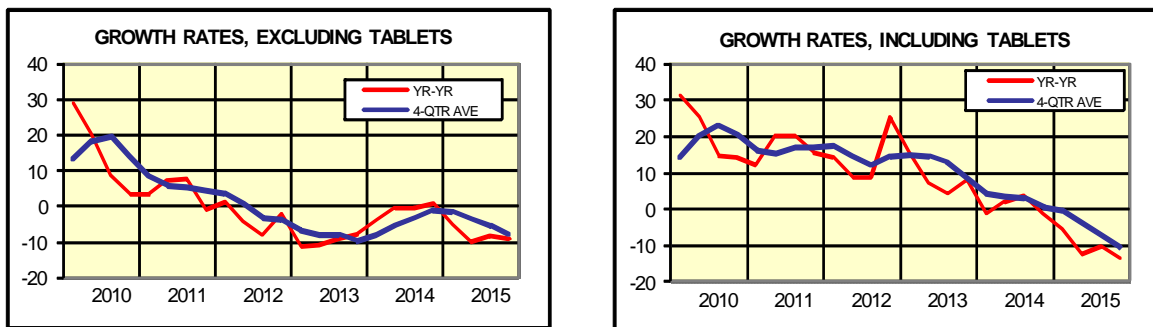


Source: Custer Consulting & Financial Reports

DOUBLE-DIGIT DECLINES FOR PCs IN 2015

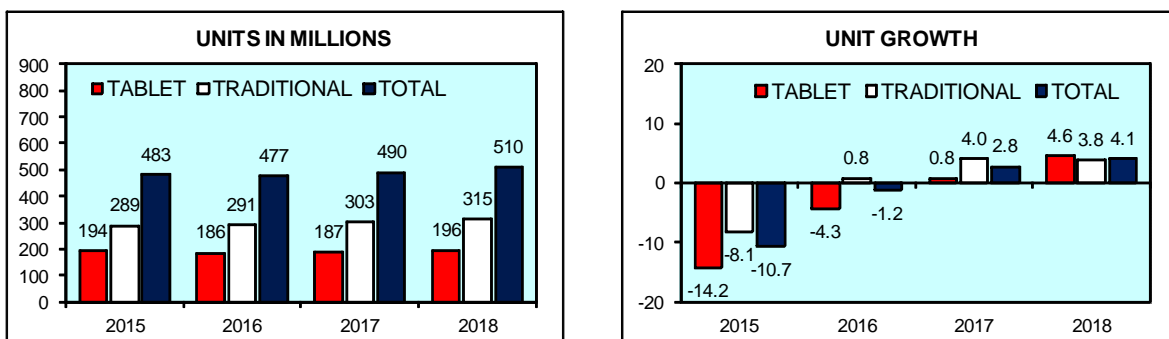
The subsidy-driven economic rebound that followed the financial crisis resulted in strong PC sales in 2010. Traditional PCs grew by 14.0 percent that year. Since then, consumers have found that smartphones could take care of much of the light-duty computations and transactions that normally took place on a PC, especially after the introduction of large-screen smartphones. As a result, growth rates plunged, resulting in four straight years of declining demand for traditional PCs, as captured by the 4-quarter moving average growth rate presented in the left chart of Figure 1.2.4. For the fourth quarter of 2015, year-to-year shipments were down 9.0 percent. The 4-quarter moving average posted an 8.1 percent decline. And when the market trends for tablets are taken into account, the results were even worse, as shown in the right chart. Fourth quarter deliveries were off 13.7 percent; the 4-quarter moving average was -10.7 percent.

FIGURE 1.2.4
GLOBAL UNIT PC SHIPMENTS



There is an absence of compelling features that would motivate a new surge in either traditional PCs or tablets. Consequently, 2016 will be another down year with tablets falling 4.3 percent while traditional PCs increase 0.8 percent, as enterprise purchases begin to warm to Windows 10 late in the year. But overall, shipments will be off by 1.2 percent this year, as shown on the right side of Figure 1.2.5. A tepid refresh cycle is envisioned for tablets in 2017. Windows 10 PC-driven demand will pick up, but only to the extent of a 4.0 percent gain next year. Total shipments will be up only 2.8 percent. Moreover, prices will be stagnant or worse.

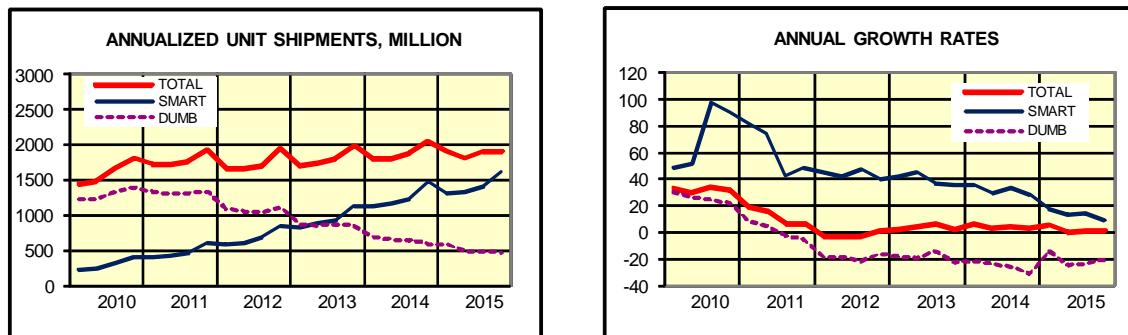
FIGURE 1.2.5
UNIT PC SHIPMENTS INCLUDING TABLETS



THE EVER-SLOWING GROWTH RATE FOR SMARTPHONES

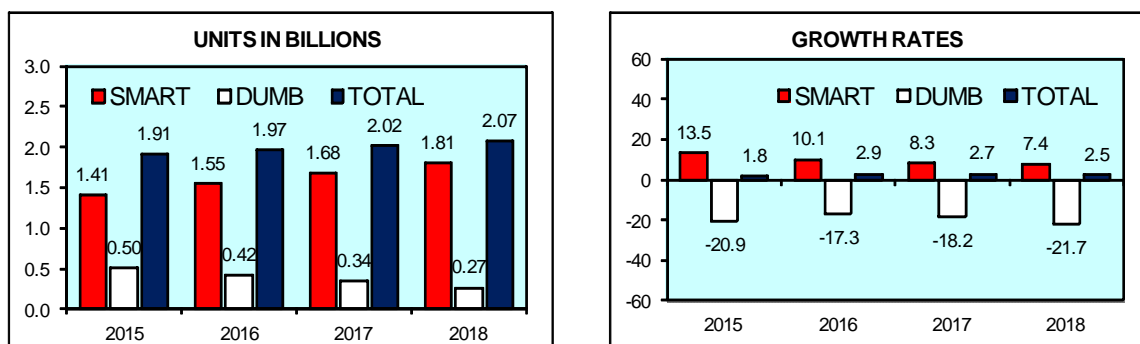
During the fourth quarter of last year, smartphones accounted for 84 percent of the 1.91 billion annualized units shipped during that period. But smartphone shipments continue to slow, as shown in the right chart of Figure 1.2.6. From growth rates that approached 100 percent during the third quarter of 2010, there has been a secular deceleration that has brought the expansion rate down to 9.6 percent during the final quarter of last year. During that period, iPhone sales were down 4.4 percent after huge gains fueled by the enthusiastic Chinese reception of Apple's products. Not only has Apple picked the low-hanging fruit in the Middle Kingdom, but the economic slowdown there has precipitated more conservative purchasing habits among the Chinese. Increased demand for less-flashy products, as well as a growing preference for local companies, enabled Huawei Technologies to ramp up their share of global sales to 8 percent in the final quarter of last year.

FIGURE 1.2.6
GLOBAL UNIT MOBILE PHONE SHIPMENTS



According to Gartner, the combination of Apple and Samsung captured 38.4 percent of global shipments during the fourth quarter of last year. That compares to 40.3 percent a year earlier. The economic slowdown has made consumers more selective worldwide. That has opened the doors to Asian manufacturers that are not only selling low-priced models, but products that increasingly provide many smartphone features. As a result, smartphone shipments will continue to expand as they displace dumbphones. However, the overall mobile phone market growth will remain in low single digits, as shown in the right chart of Figure 1.2.7.

FIGURE 1.2.7
GLOBAL UNIT MOBILE PHONE SHIPMENTS



Moreover, the price premium paid for smartphones will continue to ease as market penetration in the developing world will entail continuing downward price pressure. By 2018 smartphone sales are predicted to grow by only 7.4 percent as total mobile phone shipments approach 2.1 billion, as shown on the left side of Figure 1.2.7.

3D PRINTERS COME OF AGE

Optomec is an Albuquerque-based company manufacturing 3D printing systems, also known as additive manufacturing. The company reported an 80 percent gain in revenues during the third quarter of last year. The 15-year old company produces systems for prototypes, and more recently volume-production hardware such as fuel nozzles for gas turbine engines and conformal electronics used to make antennas and sensors for mobile telephones. Industrial applications have motivated GE and Autodesk to make a strategic investment in the company last year. The collaboration is envisioned to develop machine interoperability that will benefit a wide range of industries with the help of sophisticated software from Autodesk. The breath of applications is huge. The ability to print antennas, sensors and other electronic components have immediate applicability to wearable devices and modules for the Internet of things (IoT). While there is little doubt that the breath of additive processing applications is enormous, an estimate of the addressable market for the printers themselves is not entirely clear. By some estimates the additive manufacturing industry will exceed annual revenues of \$35 billion by 2020. But the market for consumer and industrial systems and parts will be in the neighborhood of a modest \$13 billion. The remainder will be spread over materials, tooling and service providers.

FURTHER COMMENTS ON THE IoT MARKET

In our December report, we included a fairly extensive commentary on the IoT opportunity. Given the continuing publication of blue-sky forecasts of trillion, yes TRILLION, dollar opportunities some additional observations would seem to be in order. The IoT market is nebulous to put it mildly. By some estimates market value will exceed \$1 trillion by 2020 with growth rates in the vicinity of 30 percent. Given that global equipment production is now in the vicinity of \$2 trillion, the industry appears on the verge of adding 50 percent to its output over the next five years. The market estimate is said to include IoT and machine-to-machine (M2M) communications that connect “objects” via the Internet. It, therefore, could include the value of PCs, cell phones and any interconnected object you might want to consider. The problem is that by including the value of a platform such as a washing machine, the market opportunity is grossly inflated.

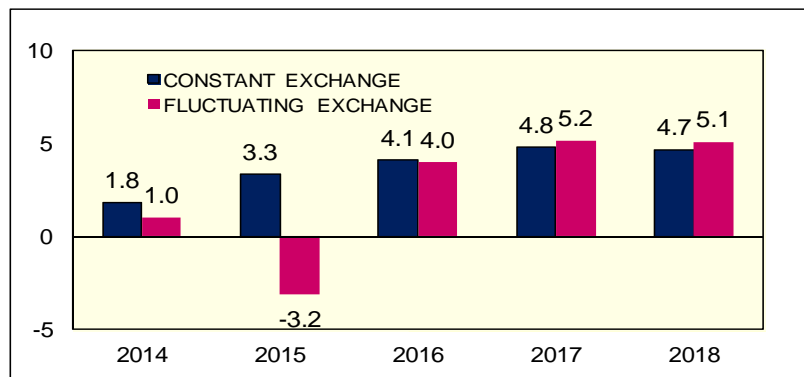
A better approach would be to look at the actual IoT units. Several estimates put the installed base at roughly 20 billion units in 2015 with shipments running about 5 billion. By 2020, the installed base is projected to be in the vicinity of 30 billion and shipments would approximate 10 billion units. That works out to a shipments growth rate of roughly 15 percent. The 2015 estimate of 5 billion unit shipments might seem high for a market opportunity that has only recently received massive media attention. But it appears reasonable given that mobile phone shipments approximated 2 billion units. Therefore, given all the other areas of ongoing applications that

include health monitoring, smart meters, engines, PCs, tablets and many more, the 5 billion figure appears to be reasonable. So is a 15 percent growth rate. But what is the value of this market?

Clearly, it depends on the sophistication of the monitoring device. Does it have to send out, say, a heart rate reading once an hour or is a real-time megabit data stream composed of hundreds of lines in an aircraft required. For some applications, the IoT device may be nothing much more than a one dollar semiconductor chip added to an existing circuit board, which Intel estimates to be a 10 billion unit opportunity. But the chip or module is basically a component market play. More sophisticated applications might require a stand-alone subsystem that could cost \$2,000 for, say, monitoring of a manufacturing process. However, most modules will still be part of the sub assembly market. In short IoT products will not greatly move the needle for the global electronic equipment industry. And given the slowing unit growth in PCs and mobile phones, along with the displacement of computer equipment demand by shared resources in the cloud, the world equipment market will achieve only modest growth during the next few years.

In fact, growth rates will only hit 4.7 percent in 2018 based on constant 2015 exchange rates. It is noted that exchange rates are not forecast to change substantially in aggregate during the 2016-2018 period, versus the extraordinary volatility during 2015. In that year, there was a 6.5 percentage point difference between the constant-exchange rate statistics and data computed using fluctuating exchange, as shown in Figure 1.2.8.

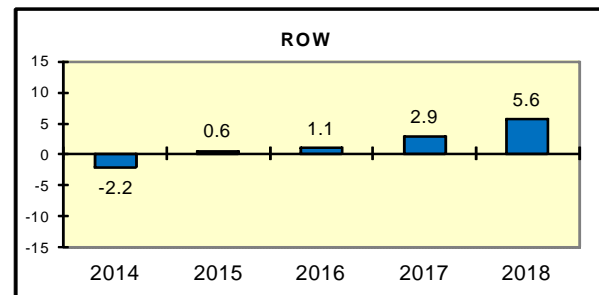
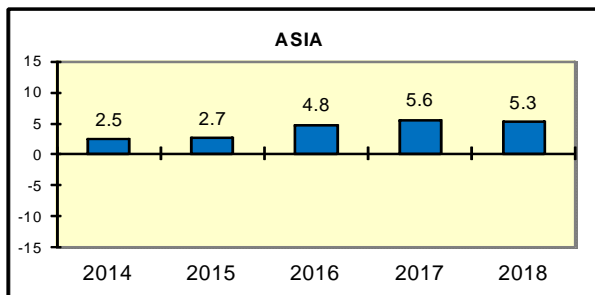
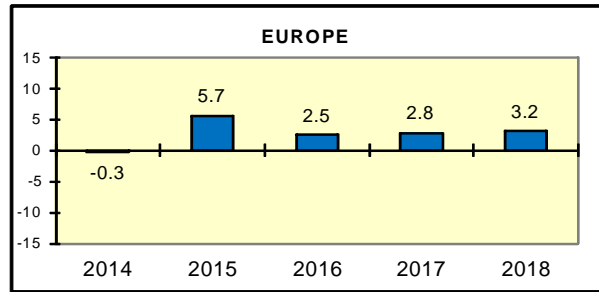
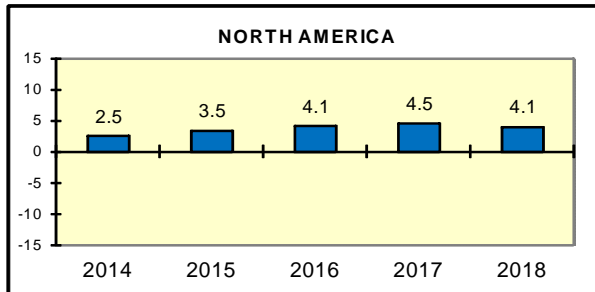
FIGURE 1.2.8
WORLD PRODUCTION OF ELECTRONIC EQUIPMENT



An illustrated breakdown of key regional and national prospects is provided in Figure 1.2.9. Detailed projections of the electronic equipment categories appear in Table 1.2.1. Equivalent forecasts of the geographical landscape is shown in Table 1.2.2.

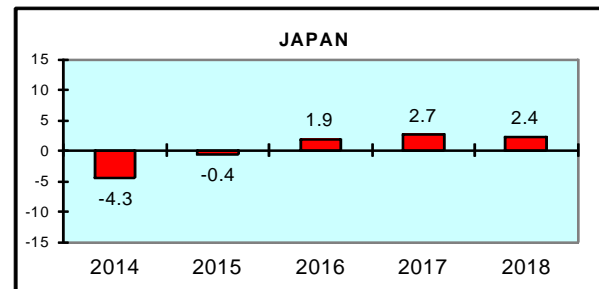
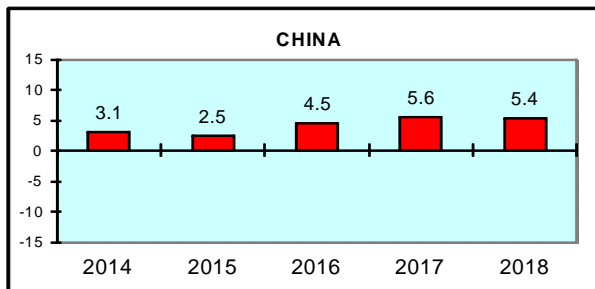
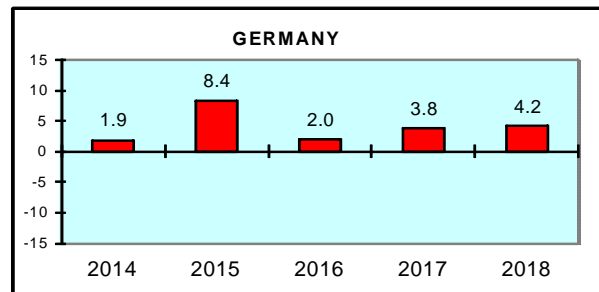
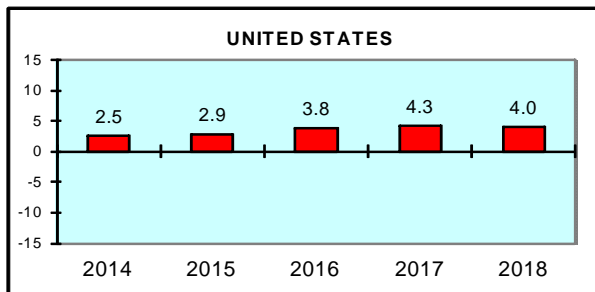
Please refer to the Table of Contents for the locations of the various equipment sorts that appear in the database sections of this report.

FIGURE 1.2.9
WORLD ELECTRONIC EQUIPMENT PRODUCTION
Current Dollar Growth Rates Converted at Constant 2015 Exchange Rates



REGIONAL GROWTH AT CONSTANT EXCHANGE						GLOBAL PC AND CELLULAR HANDSET MARKETS					
CATEGORY	2014	2015	2016	2017	2018	CATEGORY	2014	2015	2016	2017	2018
WORLD	1.8	3.3	4.1	4.8	4.7	PC UNITS, MILLION (a)	315	289	291	303	315
NORTH AMERICA	2.5	3.5	4.1	4.5	4.1	PC GROWTH RATES	-1.0	-8.1	0.8	4.0	3.8
EUROPE	-0.3	5.7	2.5	2.8	3.2	CELLPHONE UNITS, M	1880	1914	1970	2023	2074
ASIA	2.5	2.7	4.8	5.6	5.3	CELLPHONE GROWTH	4.2	1.8	2.9	2.7	2.5
ROW	-2.2	0.6	1.1	2.9	5.6						

(a) Excludes tablets



**TABLE 1.2.1
WORLD ELECTRONIC EQUIPMENT PRODUCTION**

US \$ MILLIONS CONVERTED AT CONSTANT 2015 EXCHANGE RATES

WORLD		2013	2014	2015	2016	2017	2018	2019	2020	15-20
TOTAL	VALUE	1,897,891	1,932,065	1,996,332	2,077,964	2,176,986	2,278,336	2,347,376	2,458,988	4.3
51 BUSINESS	US\$, M	43,326	42,519	42,054	41,901	42,483	42,936	42,699	43,150	0.5
52 COMMUNICATIONS	US\$, M	411,334	417,206	436,411	463,191	492,574	521,745	541,621	569,577	5.5
53 CONSUMER	US\$, M	237,992	232,557	234,447	242,372	250,429	259,528	262,796	271,299	3.0
54 COMPUTER	US\$, M	489,438	492,049	487,086	496,957	513,458	531,982	543,274	567,040	3.1
55 MILITARY	US\$, M	158,235	162,405	167,980	174,870	182,626	190,207	197,103	205,837	4.1
56 INDUSTRIAL	US\$, M	177,787	183,104	190,217	200,156	211,011	222,103	230,089	242,271	5.0
57 INSTRUMENT	US\$, M	236,538	245,304	268,031	277,604	291,437	305,510	316,458	331,849	4.4
58 AUTOMOTIVE	US\$, M	143,241	156,923	170,105	180,913	192,968	204,326	213,335	227,965	6.0

ANNUAL GROWTH RATES

WORLD		2013	2014	2015	2016	2017	2018	2019	2020	15-20
TOTAL	VALUE	-1.3	1.8	3.3	4.1	4.8	4.7	3.0	4.8	4.3
51 BUSINESS	US\$, M	-3.4	-1.9	-1.1	-0.4	1.4	1.1	-0.6	1.1	0.5
52 COMMUNICATIONS	US\$, M	-2.9	1.4	4.6	6.1	6.3	5.9	3.8	5.2	5.5
53 CONSUMER	US\$, M	-2.3	-2.3	0.8	3.4	3.3	3.6	1.3	3.2	3.0
54 COMPUTER	US\$, M	-3.0	0.5	-1.0	2.0	3.3	3.6	2.1	4.4	3.1
55 MILITARY	US\$, M	-1.4	2.6	3.4	4.1	4.4	4.2	3.6	4.4	4.1
56 INDUSTRIAL	US\$, M	-2.7	3.0	3.9	5.2	5.4	5.3	3.6	5.3	5.0
57 INSTRUMENT	US\$, M	1.8	3.7	9.3	3.6	5.0	4.8	3.6	4.9	4.4
58 AUTOMOTIVE	US\$, M	8.9	9.6	8.4	6.4	6.7	5.9	4.4	6.9	6.0

PRODUCTION SHARE OF WORLD

WORLD		2013	2014	2015	2016	2017	2018	2019	2020	15-20
TOTAL	VALUE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
51 BUSINESS	US\$, M	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	-3.6
52 COMMUNICATIONS	US\$, M	21.7	21.6	21.9	22.3	22.6	22.9	23.1	23.2	1.2
53 CONSUMER	US\$, M	12.5	12.0	11.7	11.7	11.5	11.4	11.2	11.0	-1.2
54 COMPUTER	US\$, M	25.8	25.5	24.4	23.9	23.6	23.3	23.1	23.1	-1.1
55 MILITARY	US\$, M	8.3	8.4	8.4	8.4	8.4	8.3	8.4	8.4	-0.1
56 INDUSTRIAL	US\$, M	9.4	9.5	9.5	9.6	9.7	9.7	9.8	9.9	0.7
57 INSTRUMENT	US\$, M	12.5	12.7	13.4	13.4	13.4	13.4	13.5	13.5	0.1
58 AUTOMOTIVE	US\$, M	7.5	8.1	8.5	8.7	8.9	9.0	9.1	9.3	1.7

PRODUCTION SHARE OF REGION

WORLD		2013	2014	2015	2016	2017	2018	2019	2020	15-20
TOTAL	VALUE	NA	NA	NA	NA	NA	NA	NA	NA	NA
51 BUSINESS	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
52 COMMUNICATIONS	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
53 CONSUMER	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
54 COMPUTER	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
55 MILITARY	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
56 INDUSTRIAL	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
57 INSTRUMENT	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA
58 AUTOMOTIVE	US\$, M	NA	NA	NA	NA	NA	NA	NA	NA	NA

SHARE OF WORLD PRODUCTION FOR EACH EQUIPMENT CATEGORY

WORLD		2013	2014	2015	2016	2017	2018	2019	2020	15-20
TOTAL	VALUE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
51 BUSINESS	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
52 COMMUNICATIONS	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
53 CONSUMER	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
54 COMPUTER	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
55 MILITARY	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
56 INDUSTRIAL	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
57 INSTRUMENT	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
58 AUTOMOTIVE	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0

**TABLE 1.2.2
WORLD ELECTRONIC EQUIPMENT PRODUCTION**

US \$ MILLIONS CONVERTED AT CONSTANT 2015 EXCHANGE RATES

50 TOTAL EQUIPMENT		2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD	US\$, M	1,897,891	1,932,065	1,996,332	2,077,964	2,176,986	2,278,336	2,347,376	2,458,988	4.3
NORTH AMERICA	US\$, M	401,446	411,627	425,833	443,330	463,247	482,052	496,306	519,874	4.1
EUROPE	US\$, M	362,505	361,340	381,794	391,465	402,606	415,310	424,065	436,041	2.7
ASIA	US\$, M	1,070,018	1,096,598	1,125,851	1,179,614	1,245,746	1,311,907	1,355,035	1,428,477	4.9
ROW	US\$, M	63,921	62,501	62,854	63,556	65,387	69,067	71,971	74,596	3.5
UNITED STATES	US\$, M	328,749	337,054	346,721	359,749	375,179	390,245	400,745	419,486	3.9
CHINA	US\$, M	800,807	825,830	846,469	884,898	934,316	984,982	1,018,398	1,078,058	5.0
JAPAN	US\$, M	73,896	70,683	70,366	71,729	73,657	75,397	75,036	76,405	1.7

ANNUAL GROWTH RATES

50 TOTAL EQUIPMENT		2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD	US\$, M	-1.3	1.8	3.3	4.1	4.8	4.7	3.0	4.8	4.3
NORTH AMERICA	US\$, M	-2.7	2.5	3.5	4.1	4.5	4.1	3.0	4.7	4.1
EUROPE	US\$, M	0.0	-0.3	5.7	2.5	2.8	3.2	2.1	2.8	2.7
ASIA	US\$, M	-1.7	2.5	2.7	4.8	5.6	5.3	3.3	5.4	4.9
ROW	US\$, M	6.6	-2.2	0.6	1.1	2.9	5.6	4.2	3.6	3.5
UNITED STATES	US\$, M	-2.6	2.5	2.9	3.8	4.3	4.0	2.7	4.7	3.9
CHINA	US\$, M	-2.5	3.1	2.5	4.5	5.6	5.4	3.4	5.9	5.0
JAPAN	US\$, M	-6.4	-4.3	-0.4	1.9	2.7	2.4	-0.5	1.8	1.7

REGIONAL SHARE OF WORLD ELECTRONIC EQUIPMENT

50 TOTAL EQUIPMENT		2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
NORTH AMERICA	US\$, M	21.2	21.3	21.3	21.3	21.3	21.2	21.1	21.1	-0.2
EUROPE	US\$, M	19.1	18.7	19.1	18.8	18.5	18.2	18.1	17.7	-1.5
ASIA	US\$, M	56.4	56.8	56.4	56.8	57.2	57.6	57.7	58.1	0.6
ROW	US\$, M	3.4	3.2	3.1	3.1	3.0	3.0	3.1	3.0	-0.7
UNITED STATES	US\$, M	17.3	17.4	17.4	17.3	17.2	17.1	17.1	17.1	-0.4
CHINA	US\$, M	42.2	42.7	42.4	42.6	42.9	43.2	43.4	43.8	0.7
JAPAN	US\$, M	3.9	3.7	3.5	3.5	3.4	3.3	3.2	3.1	-2.5

TOTAL EQUIPMENT SHARE OF TOTAL PRODUCTION IN EACH REGION

50 TOTAL EQUIPMENT		2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
NORTH AMERICA	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
EUROPE	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
ASIA	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
ROW	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
UNITED STATES	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
CHINA	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
JAPAN	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0

TOTAL ELECTRONIC EQUIPMENT SHARE OF TOTAL WORLD PRODUCTION FOR EACH REGION

50 TOTAL EQUIPMENT		2013	2014	2015	2016	2017	2018	2019	2020	15-20
WORLD	US\$, M	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
NORTH AMERICA	US\$, M	21.2	21.3	21.3	21.3	21.3	21.2	21.1	21.1	-0.2
EUROPE	US\$, M	19.1	18.7	19.1	18.8	18.5	18.2	18.1	17.7	-1.5
ASIA	US\$, M	56.4	56.8	56.4	56.8	57.2	57.6	57.7	58.1	0.6
ROW	US\$, M	3.4	3.2	3.1	3.1	3.0	3.0	3.1	3.0	-0.7
UNITED STATES	US\$, M	17.3	17.4	17.4	17.3	17.2	17.1	17.1	17.1	-0.4
CHINA	US\$, M	42.2	42.7	42.4	42.6	42.9	43.2	43.4	43.8	0.7
JAPAN	US\$, M	3.9	3.7	3.5	3.5	3.4	3.3	3.2	3.1	-2.5

1.3 COMPANY PROSPECTOR

TRACK YOUR OPPORTUNITIES AND RISKS

If you sell to or are supplied by or compete with any of the 100 companies contained in our Prospector database, you have a vested interest in tracking their progress or lack thereof. It's probable that you already keep a close watch on corporations that represent a strategic influence on your company. For those businesses your own information file is likely to be substantially more comprehensive than the data that we supply in Chapter 6. But there may be many corporations in our database that you don't monitor. Therefore, our 100 companies provide easy access to company-profile data that are updated for you on a quarterly basis, thereby obviating the need for you to continuously update the information.

The statistics have been presorted alphabetically in this chapter. However, the tables in Chapter 6 provide additional sorts by size, equipment sector and growth rates for the latest quarter. Revenue profiles and additional information for each company are illustrated in Chapter 6, two to a page.

It is worth emphasizing that the many companies in our database have substantial revenue streams emanating from non-equipment sectors. Electronic equipment may represent a small part of the company's overall portfolio. However, many times those minority business interests represent billions of dollars' worth of electronic equipment production, either internally or by subcontractors. Those companies include IBM and Lockheed Martin. It is also noted that the profiles provided in Chapter 6 are far from comprehensive. But they provide a basis for further investigation should a company peak your interest.

The companies range from the relatively small revenues of MKS Instruments that had annualized sales of \$0.7B in the most recent quarter to behemoths such as Apple whose sales came in at \$304B during the fourth calendar quarter of 2015. In all cases, the company data are presented in billions of US dollars converted, where appropriate, at fluctuating exchange rates. Therefore, the data are not directly comparable to our fixed-exchange-rate databases in Chapters 2-5.

TABLE 1.3.1A
100 OF TOP PUBLIC EQUIPMENT VENDERS
ANNUALIZED COMPANY REVENUES AND YEAR-TO-YEAR GROWTH RATES SORTED ALPHABETICALLY
Data Converted at Fluctuating Exchange Rates
Page 1 of 2

COMPANY	EQUIP CODE (a)	\$B	\$B	\$B	\$B	GROWTH	GROWTH	GROWTH	GROWTH
		15Q1	15Q2	15Q3	15Q4	15Q1	15Q2	15Q3	15Q4
1 ABB Group	56	34.2	36.7	34.1	37.0	-9.7	-10.1	-13.3	-10.7
2 Advantest	57	1.5	1.3	1.5	1.0	14.8	-8.0	-6.2	-31.0
3 Agilent Technologies	57	3.9	4.1	4.1	4.1	-2.5	0.5	-0.8	0.2
4 Alcatel-Lucent	52	14.6	15.3	15.3	18.2	-10.3	-15.1	-11.5	-1.0
5 Ametek	57	3.9	4.0	4.0	4.0	0.9	1.3	-3.2	-3.5
6 Apple	52	232.0	198.4	206.0	303.5	27.1	32.5	22.3	1.7
7 Applied Materials	56	9.8	10.0	9.5	9.0	3.8	9.9	4.6	-4.3
8 ASML Holdings	56	7.4	7.3	6.9	6.3	-3.2	-18.8	-1.6	-15.9
9 Autoliv	58	8.7	9.2	8.7	10.1	-5.3	-3.8	-1.1	7.0
10 Bio-Rad Laboratories	57	1.9	2.0	1.9	2.0	-7.2	-5.7	-11.4	-16.8
11 BlackBerry	52	16.0	18.0	22.0	24.0	40.4	50.0	57.1	57.9
12 Boeing-Military	55	26.8	30.2	33.4	31.1	-12.1	-2.6	5.5	2.6
13 BorgWarner	58	7.9	8.1	7.5	8.5	-4.8	-7.5	-7.3	6.6
14 Boston Scientific	57	7.1	7.4	7.6	7.9	-0.3	-1.6	2.3	4.8
15 Brocade Communication	54	2.2	2.2	2.4	2.3	1.8	1.2	4.3	-0.3
16 Bruker	57	1.4	1.6	1.6	1.9	-16.6	-13.4	-5.6	-5.9
17 Canon	53	28.8	32.1	30.3	34.3	-14.8	-11.5	-9.6	-7.2
18 Ciena	52	2.5	2.4	2.8	2.4	11.0	-0.1	17.1	13.4
19 Cisco Systems	52	48.5	51.4	50.7	47.7	5.1	3.9	3.6	-0.1
20 Continental AG	58	43.1	44.4	42.8	43.3	-6.3	-5.1	-6.9	-2.8
21 CRAY	54	0.3	0.7	0.8	1.1	44.5	118.6	20.1	2.1
22 Danaher	57	19.5	20.5	20.1	23.5	4.5	3.3	3.1	8.6
23 Delphi Automotive	58	15.2	15.4	14.5	15.5	-11.2	-13.3	-12.4	-6.6
24 Draeger Medical	57	1.4	1.6	1.6	1.6	7.6	13.7	1.8	-20.7
25 EADS-Military	55	11.7	13.0	12.7	12.4	-22.0	-14.8	-10.7	-48.5
26 Eaton	50	20.9	21.5	20.8	20.2	-4.9	-6.8	-9.2	-9.1
27 EMC	54	22.5	24.0	24.3	28.1	2.4	2.0	0.8	-0.5
28 Emerson Electric	56	21.6	22.0	23.3	18.9	-7.1	-12.8	-14.6	-15.6
29 Entegris	56	1.1	1.1	1.1	1.1	58.8	11.6	-1.0	-1.8
30 Federal-Mogul	58	7.3	7.8	7.3	7.0	3.1	4.8	-2.5	-2.5
31 FEI	57	0.9	0.9	0.9	1.1	-2.4	-5.4	-6.7	2.7
32 Finmeccanica	55	12.0	14.7	13.5	13.2	-26.0	-25.8	-23.2	-44.9
33 General Dynamics	55	31.1	31.5	32.0	31.2	6.3	5.5	3.1	-6.6
34 Gentex	58	1.5	1.5	1.6	1.6	9.9	12.1	11.1	16.0
35 Halliburton	56	28.2	23.7	22.3	20.3	-4.1	-26.5	-35.8	-42.1
36 Harris	55	4.7	6.1	7.2	7.4	-6.4	15.5	56.7	52.8
37 Hewlett-Packard	54	101.8	101.4	102.9	96.5	-6.8	-8.1	-9.5	-10.1
38 Hill-Rom Holdings	57	1.9	1.9	2.3	2.6	14.3	19.3	19.6	42.2
39 Hitachi High-Technologies	56	5.9	5.0	5.4	4.8	-25.7	-18.3	-12.1	-8.5
40 Honeywell-Aerospace	55	14.4	15.3	15.3	15.9	26.2	28.0	-1.9	3.7
41 HTC	52	166.1	132.0	85.6	103.0	25.4	-49.3	-48.9	-46.2
42 IBM	54	78.4	83.3	77.1	88.2	-12.9	-14.6	-13.9	-8.5
43 Intuitive Surgical	57	2.1	2.3	2.4	2.7	14.5	14.4	7.2	11.9
44 Itron	56	1.8	1.9	1.9	2.0	-5.6	-3.9	-5.5	-3.9
45 Johnson Controls	58	36.8	38.4	35.0	35.7	-12.1	-11.1	-19.0	-16.3
46 Juniper Networks	52	4.3	4.9	5.0	5.3	-8.8	-0.6	10.9	19.8
47 Keysight Technologies	57	3.0	2.7	3.0	2.9	-0.4	-12.2	-1.6	2.9
48 KLA-Tencor	56	3.0	3.0	2.6	2.8	-11.2	3.0	0.0	5.0
49 Konica Minolta	51	7.7	8.2	8.5	8.4	-24.4	-8.3	-12.2	-5.9
50 L. M. Ericsson	52	14.4	14.2	13.5	15.8	-1.4	-11.9	-23.3	-16.8

(a) EQUIPMENT CODES: 51=Business, 52=Communications, 53=Consumer, 54=Computer, 55=Military, 56= Industrial, 57=Instruments, 58=Automotive

TABLE 1.3.1B

**100 OF TOP PUBLIC EQUIPMENT VENDERS
ANNUALIZED COMPANY REVENUES AND YEAR-TO-YEAR GROWTH RATES SORTED ALPHABETICALLY
Data Converted at Fluctuating Exchange Rates
Page 2 of 2**

COMPANY	EQUIP CODE (a)	\$B 15Q1	\$B 15Q2	\$B 15Q3	\$B 15Q4	GROWTH 15Q1	GROWTH 15Q2	GROWTH 15Q3	GROWTH 15Q4
51 L3 Communications	55	10.9	11.2	11.3	11.5	-8.3	-7.5	-4.2	-10.5
52 Lam Research	56	5.6	5.9	6.4	5.7	13.5	18.6	38.8	15.7
53 Lear	58	18.1	18.5	17.3	18.9	3.7	1.1	2.3	3.8
54 Lenovo Group	54	45.3	42.9	48.6	51.7	21.1	3.1	16.0	-8.4
55 Lexmark International	51	3.4	3.5	3.4	3.9	-2.9	-1.4	-7.3	-5.3
56 LG Electronics	53	50.9	50.8	48.0	49.7	-4.7	-15.0	-17.4	-11.5
57 Lockheed Martin	55	40.4	46.6	45.8	51.7	-5.1	3.0	3.1	3.1
58 Medtronic	57	29.2	29.1	28.2	29.2	60.0	70.2	61.7	69.1
59 MKS Instruments	56	0.9	0.9	0.8	0.7	3.6	18.0	12.1	-15.1
60 Moog	55	2.5	2.5	2.5	2.3	-1.9	-7.2	-7.2	-9.8
61 Motorola Solutions	52	4.9	5.5	5.7	7.2	-32.1	-1.8	-1.0	-1.0
62 NCR	54	5.9	6.4	6.5	6.7	-2.8	-3.3	-2.1	-5.0
63 NetApp	54	6.2	5.3	5.8	5.5	-6.6	-10.4	-6.3	-10.7
64 Netgear	52	1.2	1.2	1.4	1.4	-11.5	-14.5	-3.2	2.2
65 Nikon	53	8.1	6.0	6.9	8.5	-16.6	-13.6	-9.3	0.5
66 Nokia	52	14.4	14.2	13.5	15.8	-1.4	-11.9	-23.3	-16.8
67 Northop Grumman	55	23.8	23.6	23.9	22.8	1.9	-2.4	-0.1	-6.8
68 Panasonic	53	67.0	61.2	62.3	62.9	-16.3	-15.6	-13.4	-9.7
69 PerkinElmer	57	2.1	2.3	2.3	2.4	-0.9	1.4	3.9	0.0
70 Philips Electronics	53	19.0	21.6	21.0	25.9	29.4	39.8	25.3	23.9
71 Pioneer	53	4.3	3.6	3.7	3.8	-17.7	-19.1	-21.1	-19.2
72 Pitney Bowes	51	3.6	3.5	3.5	3.7	-5.0	-8.1	-7.7	-4.8
73 Polycom	52	1.3	1.3	1.2	1.3	0.7	-4.7	-9.7	-9.2
74 Raytheon	55	21.2	23.4	23.1	25.3	-4.0	2.6	5.6	3.0
75 Ricoh	51	20.2	20.7	18.1	18.1	-17.0	0.2	-14.0	-6.9
76 Rockwell Automation	56	6.2	6.3	6.4	5.7	-3.1	-4.5	-9.8	-9.4
77 Rockwell Collins	55	5.4	5.2	5.5	4.7	5.4	2.3	-1.3	-4.6
78 SanDisk	54	5.3	4.9	5.8	6.2	-11.9	-24.3	-16.8	-11.1
79 Seagate Technology	54	13.3	11.7	11.7	11.9	-2.2	-11.3	-22.7	-19.2
80 Seiko Epson	53	9.1	8.6	9.2	9.7	-7.5	-10.9	-9.9	-8.0
81 Sharp	53	23.4	20.4	21.7	21.8	-22.1	-16.1	-20.4	-18.0
82 Smith & Nephew	57	4.4	4.7	4.4	5.0	2.9	1.8	-3.7	0.6
83 Sony	53	65.1	59.6	62.0	85.0	-10.7	-15.9	-15.2	-5.2
84 St Jude Medical	57	5.4	5.6	5.4	5.8	-1.3	-2.6	-2.4	0.6
85 Stryker	57	9.5	9.7	9.7	10.9	3.2	2.9	1.3	3.7
86 TCL	53	15.0	15.1	17.3	21.3	7.2	3.1	5.2	2.7
87 Teledyne Technologies	57	2.3	2.3	2.2	2.4	-1.5	-3.2	-7.6	-3.6
88 Teradyne	56	1.4	2.1	1.9	1.3	6.7	-2.4	-2.5	-1.5
89 Thermo Fisher Scientific	57	15.7	17.1	16.5	18.6	0.4	-1.2	-1.2	3.6
90 Tokyo Electron	56	6.1	5.1	6.1	5.2	-28.5	-13.4	10.3	9.3
91 TomTom	53	0.7	1.0	0.9	1.0	21.6	30.1	29.1	24.8
92 Toshiba	53	64.9	44.5	53.1	47.7	-15.0	-19.7	-18.7	-15.1
93 TRW Automotive	58	16.6	16.6	16.6	16.6	-6.8	-9.8	-0.3	-4.7
94 Unisys	54	2.9	3.1	3.0	3.2	-5.3	-5.2	-16.2	-12.8
95 Varian Medical Systems	57	3.0	3.1	3.3	3.0	-2.5	4.9	0.7	2.6
96 Visteon	58	8.1	3.2	3.2	3.3	2.4	-54.4	-59.0	-59.0
97 Waters	57	1.8	2.0	2.0	2.3	6.9	2.7	1.5	0.5
98 Western Digital	54	14.2	12.8	13.4	13.3	-4.1	-12.6	-14.8	-14.7
99 Woodward	56	2.0	2.0	2.3	1.8	2.2	-5.6	-0.5	-8.7
100 Xerox	51	17.9	18.4	17.3	18.6	-12.7	-13.3	-15.4	-7.6

(a) EQUIPMENT CODES: 51=Business, 52=Communications, 53=Consumer, 54=Computer, 55=Military, 56=Industrial, 57=Instruments, 58=Automotive

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May	Market Update
June	Quarterly Forecast
July	No Issue
August	Market Update
September	Quarterly Forecast
October	Market Update
November	Market Update
December	Quarterly Forecast

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