Goldman Sachs Economic Research

GSDEER and Trade Elasticities

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Abstract

This paper examines to which extent the Goldman Sachs GSDEER fair value model for currencies allows analysing global current account imbalances. While useful with respect to long-run equilibria, a Balassa-Samuelson style model cannot be used to answer specific medium-term questions about current account targets. We have therefore estimated very simple import and export elasticities for key current account surplus and deficit countries. Using these estimates in combination with Goldman's macro economic forecasts, we try to assess quantitatively the necessary changes in exchange rates, energy prices and growth rates to help narrow the US current account deficit, as well as the implications for other key countries. The results suggest a combination of further broad based Dollar depreciation, slowing US demand and lower oil prices would bring the trade balance to sustainable levels. Growing US exports will play an important role in this process and there is also some indication that continued growth in Chinese demand will be key for the demand rebalancing.

1) Introduction

Global imbalances remain a threat for the global economy. As the IMF has pointed out recently (see 'Global Prospects and Policy Issues', *World Economic Outlook*, September 2006), a disruptive adjustment of global imbalances remains a risk.

IMF simulations have shown such a scenario could be associated with rising inflation, sharply rising US interest rates and several quarters of sub trend growth in the US despite rising exports. According to research at the IMF, there are clear risks of even worse outcomes. A major concern is that a disorderly exchange rate adjustment and global recession would risk a severe disruption in financial markets, hurting productive capacity, depressing access to credit and aggregate demand, and leading to asset price deflation.

We believe globalization has changed the world for good and disagree with those who tend to blame all deficiencies in the world economy on the global integration that has taken place over the past three decades. Protectionism in major economies to trade and financial flows originated in developing countries is a process that can be reversed. Rising protectionism, and a worse-case scenario such as the reversal in globalization, could cause a substantial reduction in living standards across all countries, as our view is that globalization gains have not gone just one way—to developing countries. Advanced economies have gained not only because cheaper goods are now available to them but also because their products have a larger market—indeed, a sizeable expansion in demand for their goods.

To combat these risks, the IMF has already embarked on a new multilateral consultation framework, which aims at bringing key deficit and surplus countries at the same table to assess the potential for better policy coordination to avoid a disruptive adjustment.

Under the initiative of the IIE, Bruegel and KIEP, a number of organisations, including Goldman Sachs Economic research, try to assess independently the necessary policy mix that would help bring these imbalances back to a sustainable level.

Goldman Sachs' Research Group has long been using a currency fair valuation model. Since 1996 our so called GSDEER—Goldman Sachs Dynamic Equilibrium Exchange Rate—model has gone through a number of variations and re-estimations, but one of the core assumptions has always been that variations in the real exchange rate are explained by changes in productivity differentials. This standard Balassa-Samuelson framework has more recently been augmented by adding terms of trade to the set of drivers of currencies over the long-run.

While useful with respect to long-run equilibria, a Balassa-Samuelson style model cannot be used to answer the specific medium term questions that this workshop tries to answer. Below, we will briefly discuss the relevant key GSDEER results, in particular the fact that most Asian currencies appear undervalued despite continued large current account surpluses. Within the GSDEER framework it is difficult to see how trade imbalances with Asia can be corrected while these currencies remain undervalued. On the other hand, the broad trade-weighted Dollar now appears fairly valued (or to be precise, slightly undervalued), which suggests that over the very long run the US trade deficit should converge towards a sustainable level.

To answer the questions more specifically with respect to the medium term outlook, we have developed a simple FEER-style set of estimates for import and export elasticities covering the key countries under discussion. We considered four groups of countries, broadly based on geographic region and correlation of recent current account dynamics. Specifically, we have estimated simple import and export elasticities for the US, the Asian countries including Japan, the oil-exporting countries including Norway and Russia, and the other industrialised countries.

Of course, the empirical results have to be analysed with more than the usual caution, in particular given that we have only just started to gain practical experience with this kind of model.

The key results from this exercise, surprise in several respects. In particular, we find that exchange rate changes appear to have very little impact on the size of trade imbalances outside the US. However, US exports appear to react quite strongly to variations in the exchange rate. In other words, it appears to be the case that any improvement in the US trade deficit will be spread out (quite) evenly among trading partners, indicating that even a sizable correction in the US account may barely be notable for other countries. A weaker Dollar would therefore contribute to reduce global current account imbalances. Unsurprisingly, a lower oil price would help reduce energy related imbalances. Exports of oil producing countries would decline, matching reduced imports of all other countries. For non-oil exporting countries other than the US, falling oil prices would probably more than offset the negative effects from falling US import demand. Our results also highlight the importance of Chinese domestic demand growth as an important factor to rebalance the global economy in light of a slowing US demand.

Section 2 and 3 after this introduction will briefly discuss our GSDEER framework, present our current estimates of currency misalignment and discuss the link between GSDEER and current account imbalances.

In Section 4 we will briefly introduce the methodology underlying our estimated import and export elasticities. This will be followed by a description of the data in Section 5. Estimation results will be presented in Section 6.

Finally, in Section 7 we will use our estimation results and try to put them into context with the three scenarios that form the core assumptions of this workshop.

Section 8 will summarise the key findings.

2) The GSDEER Model

We first introduced our GSDEER model (see 'Currency Valuation—GSDEER', *The Foreign Exchange Market*, September 1996) and while it has gone through several modifications, the key features have remained unchanged. Broadly, we explain variations in real exchange rates through changes in productivity and, in the most recent version also through changes in terms of trade (see 'The Evolving GSDEER Currency Model', *Global Viewpoint*, 25 January 2007).

Within the wide range of possible FX fair value models, GSDEER is probably closest described as and augmented Balassa-Samuelson model. In one earlier version we experimented with variables reflecting net foreign asset position but the empirical results were unsatisfactory.

In sum, the latest version of GSDEER tries to explain changes in real bilateral exchange rates against the US Dollar by variations in the differentials of terms of trade and productivity. We estimate the long-run cointegrating vector in a panel setting where we impose the same coefficient for each currency. The coefficients on productivity and terms of trade are 0.239 and 0.484 respectively.

Our latest fair value estimates are shown in the table below with future values based on forecasts for the explanatory variables.

The table with fair value estimates suggests that the USD is now 'slightly undervalued' against many G10 currencies. For example, our estimate for EUR/$ equilibrium is now at 1.16 compared with a spot value of 1.30, implying 11.6% USD undervaluation. The USD is

'cheap' versus the the GBP and the CHF. On the other side of the valuation spectrum, the equilibrium value for the $/JPY suggests that the dollar is roughly 8% overvalued relative to the JPY.

Outside the G10, the general bias is in the direction of dollar overvaluation. Equilibrium in Asian currencies calls generally for much stronger currencies across the region, including the Chinese Renminbi, for which we think the equilibrium value is 7.38. One of the key exceptions to the Asian undervaluation story is that the KRW now stands out in Asia as potentially significantly overvalued (33.4%). The Latin America currency bloc appears to continue undervalued, with the exception of the $/BRL—which is overvalued by 8.3%—and the $/MXN—which is close to fair value. In brief, we find that the Asian bloc and commodity currencies have further room to strengthen (e.g., CLP, ARS, VEB, EUR/NOK, and ZAR)

GSDEER Values and Misalignment

	Spot	GSDEER				Misalignment	
	31-Jan-07	3Q06*	Current (1Q07)*	4Q07	4Q08	Bilateral[1]	Trade-Weighted[1]
G3							
EUR/$	1.30	1.19	1.16	1.17	1.18	11.6%	6.3%
$/JPY	121.70	112.82	111.32	110.25	109.35	-8.5%	-8.0%
Europe							
£/$	1.96	1.63	1.59	1.60	1.57	23.5%	20.2%
EUR/GBP	0.66	0.73	0.73	0.73	0.75	10.7%	20.2%
EUR/NOK	8.15	5.36	5.62	5.66	5.91	-31.1%	-30.4%
EUR/SEK	9.03	8.16	8.12	8.35	8.56	-10.1%	-2.6%
EUR/CHF	1.62	1.53	1.50	1.49	1.49	-7.5%	-3.9%
EUR/CZK	28.29	31.39	29.97	30.54	31.18	5.9%	7.1%
EUR/HUF	257.69	274.47	281.84	300.74	310.29	9.4%	10.5%
EUR/PLN	3.93	4.75	4.57	4.62	4.68	16.5%	15.7%
EUR/SKK	35.22	39.61	36.83	39.07	40.03	4.6%	3.6%
$/RUB	26.53	26.37	27.66	30.23	33.09	4.2%	-3.7%
$/TRY	1.42	2.00	2.10	2.14	2.31	47.9%	31.5%
$/ILS	4.27	3.95	4.04	3.89	3.91	-5.3%	-8.2%
$/ZAR	7.31	5.61	5.89	6.11	6.24	-19.4%	-20.5%
Americas							
$/ARS	3.11	2.17	2.32	2.48	2.71	-25.2%	-24.4%
$/BRL	2.13	2.26	2.31	2.34	2.41	8.6%	11.8%
$/CAD	1.18	1.15	1.17	1.15	1.15	-1.3%	-1.4%
$/MXN	11.04	10.75	11.13	11.07	11.26	0.8%	1.6%
$/CLP	543.53	349.27	361.61	378.00	391.28	-33.5%	-32.6%
$/PEN	3.20	2.43	2.51	2.58	2.59	-21.5%	-18.6%
$/COP	2260	1997.38	2074.89	2085.03	2136.56	-8.2%	-5.2%
$/VEB	2147	1459.09	1622.63	1724.72	2006.07	-24.4%	-24.3%
Asia							
AUD/$	0.77	0.83	0.80	0.79	0.76	3.6%	-1.5%
$CNY	7.77	7.10	7.38	7.10	6.99	-5.0%	-4.8%
$/HKD	7.81	6.89	7.09	7.10	7.33	-9.2%	-6.8%
$/INR	44.06	45.58	46.50	47.82	49.40	5.5%	-7.8%
$/KRW	943.22	1195.26	1253.74	1251.96	1285.03	32.9%	36.9%
$/MYR	3.50	2.89	2.89	2.86	3.16	-17.5%	-16.9%
NZD/$	0.69	0.61	0.61	0.60	0.60	-11.5%	14.8%
$/SGD	1.54	1.51	1.54	1.52	1.52	-0.1%	3.6%
$/TWD	32.97	27.03	27.39	28.20	29.11	-16.9%	-15.2%
$/THB	34.25	34.48	35.31	35.62	36.28	3.1%	4.1%
$/IDR	9093	7913.91	8315.37	8286.02	8526.34	-8.6%	3.9%
$/PHP	48.93	46.60	48.27	49.63	51.60	-1.4%	2.0%
USD TWI	285.65						-5.3%

[1] Bilateral misalignments are reported for the second currency in the pair with the exception of EUR/$, GBP/$, AUD/$, and NZD/$. A negative misalignment indicates that a currency is undervalued relative to its anchor currency. A negative trade-weighted misalignment indicates that a currency is undervalued on a broad basis. hat is, the $/JPY biateral misalignment shows the misalignment of the JPY against the USD, with a positive figure indicating overvaluation of the JPY.

* "Current" represents the current quarter, the column left of current represents the last quarter to be updated with over 75% of actual data.

On a trade weighted basis we find that the dollar is slightly undervalued at -5.3%, illustrating that the significant declines against a few major commodity currencies and some in the Latin

American bloc have been offset by the failure to fall broadly against its most important trading partner, Asia.

3) GSDEER and Current Account Targets

As illustrated in the previous section, our GSDEER model does not include any variables describing external imbalances. As a result, GSDEER is not suited to assess the necessary exchange rate moves necessary to bring external account to sustainable levels.

Implicitly our model assumes that the current account balance asymptotically approaches a sustainable equilibrium level as long as the currency remains close to fair value. At that level domestic and foreign producers of tradable goods should be similarly competitive and hence over time the reasons to favour one group over the other should dissipate. In the very long run, a sustainable current account balance will be the result.

GSDEER therefore implicitly suggests that current trade weighted Dollar levels, are likely to be sufficient to lead to a substantial narrowing of the current account deficit but only in the very long run.

Having said that, it will be difficult for the US to achieve a balanced position with many Asian countries in particular, because the Dollar remains generally expensive vis-à-vis these currencies. Further Dollar depreciation relative to key Asian currencies would therefore be necessary, as indicated by the levels of misalignment in the table above.

One related question arising is the concept of sustainable current account deficit, in particular for the US. We have extensively researched this topic and currently assume a deficit in the 3% of GDP area as sustainable (see 'US Balance of Payments, Unsustainable, But …', *Global Economics Paper* No. 104, 3 March 2004) which is in line with the assumptions underlying this workshop.

While a currency at fair value should facilitate long-run convergence of the current account to sustainable levels, the process would obviously be accelerated by the undervaluation embedded in case of current account deficits and overvaluation in case of surpluses. Unfortunately, the GSDEER framework does not allow quantifying how much a currency has to be misaligned in order to accelerate convergence to sustainable current account levels.

4) Import and Export Elasticities

To estimate the FX movements necessary to achieve a specific current account target, we have to estimate import and export functions with respect to the key determinants, demand and relative prices, i.e. exchange rates and key commodity prices.

This approach follows closely the medium-term FEER models first developed by Williamson (see 'Estimating Equilibrium Exchange Rates', *Institute for International Economics*, September 1994). We leave considerations about the long-term sustainability of a specific current account position aside and hence do not consider the international investment position as a critical variable for the specific issues discussed here. The example of the last couple of years has shown that valuation changes can dominate over long periods the dynamics in the international investment position. Specifically the US has managed to fully offset a deterioration of the international investment position through valuation gains on FX and/or equity related investments.

The more medium-term FEER approach is based on simultaneous internal and external equilibrium. From an individual country perspective, the internal equilibrium is given by the condition that output should be in line with potential. Hence a sudden rise in domestic demand would lead to an appreciation in the exchange rate to crowd out export and encourage imports. For any net trade position there is an exchange rate that balances demand and supply.

The simultaneous external equilibrium is obtained when this exchange rate also corresponds to a **sustainable** net trade position.

A typical empirical estimate of a FEER model starts off with the determination of a sustainable net trade or current account position. In this paper these have been pre-determined through the explicit 3% target for the US current account balance in the workshop scenarios.

In a second step, trade elasticities have to be estimated with respect to domestic demand, foreign demand and the real exchange rate, as well as other potentially important factors such as energy prices.

Finally, with the estimates at hand, the medium-term equilibrium exchange rate is determined as the one that is consistent with the sustainable current account position assuming both domestic and foreign demand at potential.

Empirically, a number of choices have to be made when estimating the trade elasticities and our strategy can be described as follows.

- We were interested in long-run factors driving import and export demand.
- We were worried that recent rapid changes in global trade flows dominate our estimates. In particular, with China's increasingly explicit policy stance towards slowing the growth of the trade deficit it appears dangerous to give too much weight to recent periods.
- We assumed that there are 4 largely homogeneous groups of countries that display similar elasticities, notably the Oil exporting countries, the Asian export nations and the industrialised countries. Given its exceptionally large current account deficit we did not include the US in the industrialised countries group and estimated its elasticities individually.
- In addition to demand and relative prices, international trade also depends on the uneven endowment with national resources, in particular energy.

Based on these considerations, we used fixed-effect panel estimation for the each of the four groups. We were interested in the long-run relationship, rather than short-term dynamics, hence we directly estimated the cointegrating vector. When running the estimation for oil-importing countries we controlled for crude oil prices on the import side and we included the same variable on the export side for oil exporting countries.

5. Data

As a general rule we used national data sources accessed via Haver Analytics.

Our dependent variables are imports and exports as % of GDP.

On the right hand side or the set of explanatory variables, we used real domestic demand in local currency. Whenever data on domestic demand was not available we used real GDP. Foreign demand is calculated as the weighted average of trading partners' real domestic demand. The weights depend on the foreign countries' shares in the exports of each country.

The real trade weighted exchange rate is based on a weighting matrix that has been adjusted for the countries considered in this *Paper*. The nominal exchange rates were deflated using national CPI data.

To control for inflation, the annual average price of WTI crude oil is deflated by US CPI.

All time series used are annual. Exchange rates are based on period averages. For most countries the data starts in 1973 but for a few countries, in particular those in the Middle East we found only a few years of data.

6. Estimation Results

For each region we estimated imports as % of GDP as a function of the real effective exchange rate and real domestic demand, both lagged by one year. Exports as % of GDP were estimated as a function of the real effective exchange rate, real foreign demand weighted by trading partners' export weights and the crude oil price in real terms. All variables are in logarithms. The results are reported in Appendix 1.

US: The Results for the US in Tables 1 and 2 are generally in line with expectations. A 10% real appreciation leads to an 8.3% reduction in exports. A 10% rise in foreign demand typically causes a 5.8% increase in exports. Both variables are highly significant.

On the other side, changes in the real exchange rate do not appear to affect imports. The coefficient on this variable is not significantly different from zero. But imports do react quite strongly to changes in US demand. For every 10% increase in domestic demand, imports rise by 7.2%—more so than exports to an equivalent increase of foreign demand. Unsurprisingly, imports also rise when real oil prices go up. Our estimates suggest a 10% increase in the real oil price leads to a 1% increase in imports.

These estimates are fairly similar to other empirical work in this area, in particular the higher sensitivity of imports to domestic demand compared to exports and foreign demand. It is interesting that imports do not react to changes in the real exchange rate but this is consistent with other research, which suggest foreign exporters and US wholesalers adjust their margins in response to changes in the exchange rate to maintain market share[1]. Moreover, extensive use of hedging instruments may smooth out the FX related influences on imports to an extent where the variation no longer helps explain any swings in imports.

Other Industrialised Countries: The results for other industrialised countries in Tables 3 and 4 suggest exports still benefit from a weaker exchange rate, but only about half as much when compared to the reaction of US exports. This to some extent mirrors the results for US imports which appear to react very little to FX moves. Exporters in other industrialised countries may be willing to adjust their profit margin to a larger extent than US exporters. Hedging of FX also may play a bigger role as suggested above.

The bigger difference to the US results is in the import elasticity with respect to real exchange rate variations. Contrary to the results found for the US, the coefficient is statistically significant but with an unexpected sign. Instead of increasing import demand, real exchange rate appreciation reduces imports. While unexpected, this result appears robust as we have seen these "wrong" signs when we tested several alternative empirical specifications. Also variations to the sample size do not seem to affect this relationship.

Most interesting is the fact that the exchange rate coefficient is almost identical on both equations. In other words the estimated exchange rate coefficients also apply to changes in the overall trade balance. Specifically, the trade balance in % of GDP will change by about 3.7% for a 10% move in the real effective FX rate. For example a 3% of GDP trade surplus will grow to 3.11% of GDP on the back of a 10% depreciation. That is very little and already makes clear that real appreciation will probably not be a key policy tool to reduce trade surpluses in the other industrialised countries.

[1] See for example Rebecca Hellerstein, "Who Bears the Cost of a Change in the Exchange Rate? The Case of Imported Beer", Federal Reserve Bank of New York, Staff Report no. 179, February 2004.

There are several interpretations of this result. With a high degree of global integration of supply chains many additional intermediate inputs and investment goods may have to be imported as soon as export demand soars. This also potentially suggests producers have little scope to replace foreign suppliers with domestic ones—again a possible sign of a high degree of specialisation and highly price inelastic trade flows. As a result the trade balance may change little in response to an FX move.

Imports and exports react similarly to a rise in domestic demand and foreign demand, respectively. But compared to the US, the elasticity of both trade functions is much smaller than in the US. This suggests the trade flows experienced by other industrialised countries are less sensitive to changes in the business cycle. On the export side this could be due to a specialisation in more defensive, less cyclical goods, while on the import side larger spare capacity in the domestic industry could explain why an increase in domestic demand leads to less import demand than in the US. Maybe domestic demand is geared more towards non-tradable goods than in the US.

Finally, rising oil prices lead to growing imports in other industrialised countries.

Asian Countries: We should have classified Japan in the panel of Other Industrial Countries but given its larger current account surplus and common features of soft exchange rate targets and periods with frequent FX intervention, we thought Japanese trade elasticities are probably more appropriately estimated within the Asian panel. The results are reported in Tables 5 and 6 and generally resemble the results for Other Industrial Countries.

For example, the import elasticity to FX variations also carries the wrong sign, even though the coefficient is slightly smaller than the one estimated in the export equation. In other words, real exchange rate depreciation will lead to some current account improvements given that exports grow faster than imports. Having said this, the difference between these two coefficients remains pretty small and hence exchange rate variations looks like a relatively inefficient tool to balance the external account, a similar conclusion as in the previous country group.

Import and export demand react to variations of domestic and foreign demand, but to a lesser extent than in the previous group. In particular, the import demand appears to be fairly inelastic with respect to domestic demand. As in the case with Other Industrialised countries, it looks like demand is geared more towards domestically produced goods and the local economy has sufficient slack to accommodate these variations in demand.

Interestingly, Asian countries' imports are dominated to a much larger extent by energy imports. A 10% increase in the real oil price leads to a 2.2% increase in imports, which is about twice as much as in the US and four times more than in more energy efficient Other Industrialised Countries.

Oil Producing Countries: We tried to estimate similar import and export demand functions for oil producing countries. In addition to Saudi Arabia, Venezuela and the UAE, we also included Norway and Russia in the oil producing countries. Unfortunately some of the countries had very short data sets but for Norway and Saudi Arabia the series extend back to 1970.

The estimation results are quite different than in other regions but this was expected given the different structure of these countries. Indeed this was the primary reason why we split the panel.

Unsurprisingly, exports of oil producing countries are highly dependent on the oil price. A 10% increase in the oil price increases total exports by about 3%. This appears low given that

most countries exports in this panel appear completely dominated by oil exports. Having said that, energy export prices may be less volatile than spot crude prices, in particular when other forms of hydro carbons are exported such as natural gas, whose price variations are often smoothed in long-term contracts. Finally, the dependent variable is exports in % of GDP, but GDP itself depends to a large extend on oil prices in most of these oil exporting countries. Therefore it makes sense that the estimated elasticity is less than 1.

Apart from energy prices, none of the other variables appears to be able to explain variations in exports. Variations in oil export volumes due to changes in foreign demand appear much smaller and less important than variations in prices. Changes in the exchange rate appear to have no impact on exports, which makes sense, given oil prices depend on global commodity markets and oil exporting countries behave like price takes.

On the import side, the exchange rate variable is insignificant but imports do depend on domestic demand.

Overall: The empirical results for the 4 country groups are broadly in line with expectations. As we will show in more detail below it is already clear that in many cases exchange rates will not be the right tool to reduce global imbalances. This is simply due to the fact that trade balances are pretty immune to FX in non-US industrialised countries and Asia. Relative changes in domestic demand appear to be far more important.

Having said that, the one area where trade would clearly improve on the back of exchange rate depreciation is the US. Exports are as estimated to react quite positively to Dollar weakness, whereas US imports would not be significantly affected. A weaker Dollar therefore already appears to be a key element of any policy attempt to reduce global imbalances. This of course raises the question of who would import more US products in case the Dollar weakens.

A weaker Dollar would lead to a moderate appreciation of effective exchange rates outside the US. As we have seen above, the trade surpluses in Asia and Other Industrialised Countries would decline, but on the basis of imports which fall less quickly than exports. At first it seems odd that a weaker Dollar leads to more US exports while at the same time the other key regions showing less imports. This puzzle can be solved when assuming that the US sells more products to both other regions, while at the same time these trade less with each other. In other words, the weaker Dollar allows selling more in absolute terms which is more than offset by falling exports between third countries.

7. Scenario Analysis

The purpose of our empirical work is to estimate which exchange rate changes would be necessary to bring the US current account deficit to a sustainable levels in the 3% of GDP area.

Base Scenario: The first step in such an exercise is to establish the base scenario, which is based on GS forecasts for all right hand variables in the estimated variables. For 2007 and 2008 exchange rate forecasts, we use our regular short-term forecasts, up to 2011, we gradually approach our GSDEER fair values. Shorter-term forecasts for the other variables are again based on forecasts from the GS economics department. For long-term forecasts of oil prices we use long dated oil futures and for long dated domestic demand forecasts we simply assume trend growth rates seen since 2000.

The results for the base scenario are reported in Appendix 2 and show the US trade deficit decline to about 4.4% of GDP by 2011, significantly smaller than the current 5.2% but still a good deal away from the 2.5% target that appears broadly consistent with a 3% current account deficit target (we assume a very slowly growing income deficit). According to our

base scenario, the real trade weighted Dollar will depreciate by not more than 3.5% to 2010[2]. Oil prices are expected to stabilise at about $60 per barrel.

In terms of global implications of this scenario, Oil exporting countries see their trade balances stabilise at current levels, the Eurozone will drift into surplus of about 3%, Japan's trade surplus will modestly grow to about 4%.

In Asia our model shows the most interesting results. It looks like our assumptions for continued rapid growth of domestic demand which easily outpaces foreign demand growth will push China's trade balance very quickly into deficit. In fact China will show the largest trade deficit in % of GDP of all countries by 2011. This is to some extent the result of a relatively bad fit for China export elasticities. It appears that our regression couldn't explain much of the rapid increase in Chinese exports in the last couple of years. This is visible in the fact that the last observed value for 2005 shows a trade surplus of 4.5% of GDP, which drops to -6.6% in 2006, when we extend the series with estimated values. Having said this, it is interesting that apart from this break in the series, Chinese trade balance then remains remarkably stable. As we know from the estimation results, this is mainly due to strong domestic demand in China, which outpaces growth in other regions and hence leads to more rapidly rising import demand. In future versions of this model it may be worth experimenting with foreign direct investment flows as early indicator of structural shifts in export flows.

Main Scenario: In the main scenario we try to find a variation to the Base Scenario, which allows us to reach the US current account target of 3.0% of GDP, or in our case of 2.5% for the trade balance. The idea is to see what kind of FX adjustments are necessary and what would be the consequences for the rest of the world relative to the base case.

As the estimation results already suggested, the main driver has to be a broad Dollar depreciation, given that US exports are the most sensitive trade flow in all our regressions. We assumed a number of "pain barrier" FX rates for various currencies (see Table in Appendix 2), such as EUR/$ at 1.50, $/CAD at parity and $/¥ at 90. But this was not sufficient to achieve the current account target. Only by also lowering the Oil price to $40bbl, which is probably the pain barrier level for many new investment projects in the oil producing sector, could we bring the US trade deficit to 2.5% of GDP.

Interestingly, this kind of rebalancing led to generally growing current account surpluses, except for the oil producers. In other words, the falling oil price was substantially more important for non-US trade balances then the exchange rate. Of course, this is a result of the fact that non-US trade balances react very little to changes in the exchange rates. On the other hand stronger US exports probably just disappear in the noise of global trade data if they are spread out among many counterparties.

Main Scenario Excluding Oil Price Decline: To assess the impact of Oil in our Main Scenario, we have run the simulation only with the "pain barrier" FX forecasts and unchanged oil assumption relative to the base case. The Dollar falls by about 15% on an real effective basis from 2006 levels, which is about as much as it has fallen since 2000. For comparison, our Base Scenario assumes a 3% real trade weighted Dollar decline.

In this case we see a 1.2% improvement in the US trade deficit, while at the same time Canada, Japan and some European countries see a very modest variation of their trade position. The biggest variation is in the US balance, suggesting that the burden of absorbing additional US exports is relatively evenly shared among most other countries.

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[2] Because of the lag structure of our elasticity estimates, the exchange rate in 2010 is relevant for the 2011 trade balance.

US Recession Scenario: Finally, we have also tried to assess the impact of a 1980s-style US recession, mainly because our estimates suggest trade flows react much more to variation in demand than in relative prices. We assume one year of negative growth, followed by a number of sub-trend growth years. As substantial weaker US demand will likely lead to lower oil prices also we assumed $40/bbl as in the Main rebalancing Scenario.

The result shows that the trade deficit would drop significantly but not quite as much as with the alternative currency specification in the Main scenario. By 2011, the trade deficit would drop to 2.9% of GDP.

For other countries, and similar to the base case, the drop in oil prices appears to compensate to a larger extent for the declining US import demand. Oil countries see falling trade surpluses. Many Asian trade balances seem to benefit more from the drop in oil prices than they suffer from falling import demand.

8. Summary and Outlook

Because our standard GSDEER fair value model assumes long-term convergence and, hence, is not well suited to quantify specific rebalancing scenarios, we estimated a number of simple import and export elasticities for key countries.

While these empirical results have to be analysed with the usual caution, the elasticities suggest broad Dollar weakness would substantially boost US exports, while lower oil prices and slowing domestic potentially reduces imports. Outside the US, net trade is very insensitive to exchange rate variations.

Using these elasticities we simulated how the global imbalance would look like in 2011 in a base case scenario built around forecasts by the GS Economics group. Interestingly, this baseline scenario already suggests a reduction in global imbalances—at least with regards to a declining US deficit.

We experimented with various alternative scenarios and it appears that a combination of further substantial Dollar weakness and falling oil prices would help bring the US current account deficit to sustainable levels of about 3% of GDP. We assume a Dollar decline of about 15% on a real effective basis but with additional US demand slowdown, the necessary Dollar weakness would be smaller.

Remarkably, it does look like the adjustment process would be fairly evenly distributed across the world. We could not identify any major regions that would suffer from the adjustment process, except for the oil exporters, but even there, our simulations suggest a decline in trade surpluses that would have to be deemed acceptable.

There is some uncertainty regarding the empirical fit of our model for Asian countries. It could be that the countries in the panel are more heterogeneous than assumed. Nevertheless, there are hints that strong domestic demand growth in China, which far outpaces foreign demand growth has the potential to significant narrow the trade surplus in the future and possibly even push the trade balance into deficit. This however assumes that domestic demand growth in China can maintain the current pace while at the same time becoming largely independent from exports. This is a key global rebalancing assumption which is particularly important for other Asian countries for which Chinese demand growth would pick up the slack from slowing US import demand.

Going forward, it would be interesting to further develop the Asian demand functions. The structural shifts in recent years have apparently not been perfectly captured by our estimates. Also, it would be an improvement to model more explicitly the link between oil prices and

global demand. Finally, it would be good to enforce internal consistency to make sure the sum of variations of global trade balances add up to zero.

Overall, it appears a combination of further Dollar weakness, lower oil prices and slowing US demand would help bring global imbalances to sustainable levels, without overly affecting other countries. Indeed there are hints that Chinese demand growth plays an important role in rebalancing the global economy.

Appendix 1. Estimated Trade Elasticities

1) US

Dependent Variable: LOG(XGDP_US)
Method: Least Squares
Date: 28/01/07 Time: 18:45
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.533769	0.506640	3.027338	0.0051
LOG(RERTW_US(-1))	-0.830823	0.111053	-7.481337	0.0000
LOG(FD2_US(-1))	0.577384	0.048361	11.93895	0.0000

R-squared	0.831730	Mean dependent var	-2.376749
Adjusted R-squared	0.820125	S.D. dependent var	0.135991
S.E. of regression	0.057676	Akaike info criterion	-2.778886
Sum squared resid	0.096470	Schwarz criterion	-2.641473
Log likelihood	47.46217	F-statistic	71.67112
Durbin-Watson stat	0.752604	Prob(F-statistic)	0.000000

Dependent Variable: LOG(MGDP_US)
Method: Least Squares
Date: 28/01/07 Time: 12:28
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.875355	0.325976	-24.15927	0.0000
LOG(RERTW_US(-1))	-0.119009	0.085897	-1.385481	0.1768
LOG(DD_US(-1))	0.716353	0.037949	18.87697	0.0000
LOG(OIL/CPI_US)	0.100042	0.022480	4.450276	0.0001

R-squared	0.955136	Mean dependent var	-2.201600
Adjusted R-squared	0.950329	S.D. dependent var	0.188150
S.E. of regression	0.041933	Akaike info criterion	-3.389026
Sum squared resid	0.049234	Schwarz criterion	-3.205809
Log likelihood	58.22442	F-statistic	198.7033
Durbin-Watson stat	1.360463	Prob(F-statistic)	0.000000

2) Other Industrialised Countries

Dependent Variable: LOG(XGDP?)
Method: Pooled Least Squares
Date: 28/01/07 Time: 18:44
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments
Cross-sections included: 5
Total pool (balanced) observations: 160

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.664675	0.220890	3.009079	0.0031
LOG(RERTW?(-1))	-0.370037	0.047450	-7.798463	0.0000
LOG(FD2?(-1))	0.427532	0.026259	16.28163	0.0000
Fixed Effects (Cross)				
_CANADA--C	0.084357			
_EURO--C	-0.178427			
_UK--C	-0.226042			
_SWITZERLAND--C	0.140563			
_SWEDEN--C	0.179548			

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.855926	Mean dependent var	-1.203424
Adjusted R-squared	0.850276	S.D. dependent var	0.234659
S.E. of regression	0.090799	Akaike info criterion	-1.917566
Sum squared resid	1.261411	Schwarz criterion	-1.783027
Log likelihood	160.4053	F-statistic	151.4927
Durbin-Watson stat	0.350932	Prob(F-statistic)	0.000000

Dependent Variable: LOG(MGDP?)
Method: Pooled Least Squares
Date: 28/01/07 Time: 13:30
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments
Cross-sections included: 5
Total pool (unbalanced) observations: 145

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.163953	0.669356	-7.714803	0.0000
LOG(RERTW?(-1))	-0.386101	0.051478	-7.500298	0.0000
LOG(DD?(-1))	0.414974	0.043681	9.500000	0.0000
LOG(OIL/CPI_US)	0.042968	0.021379	2.009838	0.0464
Fixed Effects (Cross)				
_CANADA--C	0.226399			
_EURO--C	-0.671006			
_UK--C	0.001273			
_SWITZERLAND--C	0.637064			
_SWEDEN--C	-0.044115			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.801878	Mean dependent var	-1.242812
Adjusted R-squared	0.791755	S.D. dependent var	0.186593
S.E. of regression	0.085150	Akaike info criterion	-2.035218
Sum squared resid	0.993316	Schwarz criterion	-1.870985
Log likelihood	155.5533	F-statistic	79.21328
Durbin-Watson stat	0.491894	Prob(F-statistic)	0.000000

3) Asia

Dependent Variable: LOG(XGDP?)
Method: Pooled Least Squares
Date: 28/01/07 Time: 18:43
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments
Cross-sections included: 8
Total pool (unbalanced) observations: 221

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.008481	0.185432	5.438546	0.0000
LOG(RERTW?(-1))	-0.359617	0.039872	-9.019336	0.0000
LOG(FD2?(-1))	0.352775	0.036682	9.617038	0.0000
Fixed Effects (Cross)				
_KOREA--C	-0.319063			
_CHINA--C	-0.989323			
_TAIWAN--C	0.011105			
_HONG_KONG--C	0.988503			
_SINGAPORE--C	1.372228			
_MALAYSIA--C	0.608004			
_INDONESIA--C	-0.321988			
_JAPAN--C	-1.468131			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.974994	Mean dependent var	-0.812522
Adjusted R-squared	0.973927	S.D. dependent var	0.946990
S.E. of regression	0.152912	Akaike info criterion	-0.873721
Sum squared resid	4.933589	Schwarz criterion	-0.719958
Log likelihood	106.5462	F-statistic	914.0973
Durbin-Watson stat	0.490732	Prob(F-statistic)	0.000000

Dependent Variable: LOG(MGDP?)
Method: Pooled Least Squares
Date: 28/01/07 Time: 13:26
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments
Cross-sections included: 8
Total pool (unbalanced) observations: 209

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.323259	0.340940	-3.881205	0.0001
LOG(RERTW?(-1))	-0.307996	0.044015	-6.997452	0.0000
LOG(DD?(-1))	0.189856	0.021795	8.711061	0.0000
LOG(OIL/CPI_US)	0.215713	0.028586	7.546243	0.0000
Fixed Effects (Cross)				
_KOREA--C	-0.470558			
_CHINA--C	-0.743150			
_TAIWAN--C	-0.716951			
_HONG_KONG--C	0.602019			
_SINGAPORE--C	2.705725			
_MALAYSIA--C	1.900148			
_INDONESIA--C	-0.877041			
_JAPAN--C	-1.847115			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.979577	Mean dependent var	-0.904464
Adjusted R-squared	0.978545	S.D. dependent var	0.948497
S.E. of regression	0.138930	Akaike info criterion	-1.058495
Sum squared resid	3.821714	Schwarz criterion	-0.882583
Log likelihood	121.6127	F-statistic	949.6886
Durbin-Watson stat	0.552567	Prob(F-statistic)	0.000000

4) Oil Producers

Dependent Variable: LOG(XGDP?)
Method: Pooled Least Squares
Date: 30/01/07 Time: 00:12
Sample (adjusted): 1974 2005
Included observations: 32 after adjustments
Cross-sections included: 5
Total pool (unbalanced) observations: 114

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.061200	0.391507	-0.156318	0.8761
LOG(RERTW?(-1))	-0.118762	0.079379	-1.496138	0.1376
LOG(FD2?(-1))	0.129731	0.083050	1.562097	0.1212
LOG(OIL/CPI_US)	0.281440	0.051730	5.440534	0.0000
Fixed Effects (Cross)				
_NORWAY--C	0.087869			
_RUSSIA--C	-0.075802			
_UAE--C	0.426580			
_SAUDIA_ARABIA--C	0.156459			
_VENEZUELA--C	-0.295886			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.616895	Mean dependent var	-0.985951
Adjusted R-squared	0.591596	S.D. dependent var	0.271665
S.E. of regression	0.173612	Akaike info criterion	-0.596398
Sum squared resid	3.194954	Schwarz criterion	-0.404384
Log likelihood	41.99467	F-statistic	24.38384
Durbin-Watson stat	0.495374	Prob(F-statistic)	0.000000

Dependent Variable: LOG(MGDP?)
Method: Pooled Least Squares
Date: 30/01/07 Time: 00:12
Sample (adjusted): 1980 2005
Included observations: 26 after adjustments
Cross-sections included: 5
Total pool (unbalanced) observations: 92

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.288255	1.254366	3.418663	0.0010
LOG(RERTW?(-1))	-0.007914	0.078098	-0.101331	0.9195
LOG(DD?(-1))	-0.559387	0.112365	-4.978306	0.0000
Fixed Effects (Cross)				
_NORWAY--C	2.421607			
_RUSSIA--C	-0.536760			
_UAE--C	-1.878406			
_SAUDIA_ARABIA--C	-1.915553			
_VENEZUELA--C	0.062603			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.738968	Mean dependent var	-1.257592
Adjusted R-squared	0.720542	S.D. dependent var	0.284852
S.E. of regression	0.150584	Akaike info criterion	-0.875557
Sum squared resid	1.927418	Schwarz criterion	-0.683681
Log likelihood	47.27560	F-statistic	40.10500
Durbin-Watson stat	1.111010	Prob(F-statistic)	0.000000

Appendix 2. Scenario Analysis
1) Base Case

Dollar Exchange Rates (quoted according to market conventions, period average)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la	WTI
2000	1.00	1.49	107.8	0.92	1.52	1.69	9.16	8.80	28.1	1130.4	8.28	31.23	7.79	1.72	3.80	8422	3.67	3.75	680	**29.0**
2001	1.00	1.55	121.5	0.90	1.44	1.69	10.33	8.99	29.2	1290.8	8.28	33.81	7.80	1.79	3.80	10261	3.67	3.75	724	**25.2**
2002	1.00	1.57	125.4	0.94	1.50	1.56	9.74	7.98	31.3	1251.6	8.28	34.58	7.80	1.79	3.80	9311	3.67	3.75	1161	**22.7**
2003	1.00	1.40	115.9	1.13	1.63	1.35	8.09	7.08	30.7	1191.6	8.28	34.42	7.79	1.74	3.80	8577	3.67	3.75	1607	**27.4**
2004	1.00	1.30	108.2	1.24	1.83	1.24	7.35	6.74	28.8	1146.2	8.19	33.43	7.79	1.69	3.80	8939	3.67	3.75	1891	**37.5**
2005	1.00	1.21	110.2	1.24	1.82	1.24	7.47	6.44	28.3	1024.3	7.97	32.18	7.78	1.66	3.79	9705	3.67	3.75	2090	**52.4**
2006(f)	1.00	1.13	116.3	1.26	1.84	1.25	7.38	6.41	27.2	955.0	7.97	32.52	7.77	1.59	3.67	9167	3.67	3.75	2147	**66.3**
2007(f)	1.00	1.16	114.1	1.34	1.95	1.19	6.66	5.99	25.5	941.0	7.61	32.32	7.80	1.51	3.50	9344	3.67	3.75	2199	**69.0**
2008(f)	1.00	1.16	105.0	1.37	1.90	1.15	6.42	5.69	25.1	925.0	7.41	31.75	7.80	1.47	3.50	9500	3.67	3.75	2350	**59.5**
2009(f)	1.00	1.16	106.3	1.31	1.79	1.19	6.71	5.47	27.8	1045.0	7.27	30.87	7.64	1.49	3.39	9175	3.67	3.75	2235	**59.6**
2010(f)	1.00	1.15	107.7	1.24	1.68	1.23	6.99	5.25	30.4	1165.0	7.13	29.99	7.49	1.50	3.27	8851	3.67	3.75	2121	**59.9**
2011(f)	1.00	1.15	109.0	1.18	1.57	1.26	7.28	5.03	33.1	1285.0	6.99	29.11	7.33	1.52	3.16	8526	3.67	3.75	2006	**59.8**

Real Effective Exchange Rate Index (period average, percentage change relative to 2006 base year)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	9%	-21%	34%	-13%	-5%	-2%	4%	-9%	-41%	-20%	4%	12%	20%	2%	-2%	-30%	-6%	10%	31%
2001	16%	-24%	19%	-13%	-7%	0%	-4%	-5%	-29%	-25%	9%	7%	20%	1%	4%	-33%	3%	14%	37%
2002	17%	-24%	12%	-11%	-6%	4%	-2%	2%	-28%	-21%	7%	4%	16%	-1%	4%	-18%	4%	13%	2%
2003	8%	-16%	15%	-1%	-7%	5%	5%	3%	-26%	-18%	2%	-1%	9%	-2%	0%	-10%	-2%	7%	-8%
2004	3%	-11%	17%	2%	0%	4%	6%	-2%	-19%	-17%	1%	-1%	3%	-2%	-4%	-14%	-4%	2%	-8%
2005	1%	-5%	10%	1%	-1%	3%	1%	1%	-10%	-7%	1%	2%	0%	-3%	-4%	-15%	-1%	-2%	-7%
2006(f)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007(f)	-2%	-4%	-2%	2%	1%	-1%	5%	2%	8%	-1%	3%	-2%	-3%	2%	2%	-1%	-2%	0%	11%
2008(f)	-4%	-4%	3%	2%	-3%	0%	7%	7%	13%	-2%	3%	-3%	-3%	3%	0%	-1%	-3%	-1%	20%
2009(f)	-4%	-3%	1%	0%	-7%	0%	6%	17%	12%	-13%	7%	0%	1%	2%	5%	9%	1%	2%	48%
2010(f)	-3%	-2%	-1%	-4%	-11%	1%	4%	28%	11%	-21%	11%	3%	5%	1%	10%	20%	5%	4%	83%
2011(f)	-3%	-2%	-3%	-7%	-15%	2%	3%	40%	12%	-29%	14%	7%	9%	-1%	16%	32%	10%	7%	127%

Trade Balances in % of GDP

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	-3.9%	5.8%	1.4%	0.2%	-2.0%	5.7%	5.9%	17.5%	20.0%	3.2%	2.0%	2.2%	4.5%	13.6%	20.0%	10.5%	21.8%	18.8%	11.6%
2001	-3.6%	5.7%	0.6%	1.1%	-2.7%	4.4%	6.5%	17.2%	12.7%	2.3%	1.7%	5.2%	4.5%	15.1%	18.4%	8.1%	14.8%	15.8%	3.3%
2002	-4.1%	4.4%	1.3%	2.1%	-2.9%	6.4%	6.7%	13.6%	10.8%	1.4%	2.1%	7.2%	8.3%	16.9%	18.3%	6.2%	11.3%	17.4%	12.3%
2003	-4.6%	3.7%	1.6%	1.5%	-2.7%	6.6%	6.5%	13.3%	11.3%	2.4%	1.5%	7.5%	9.2%	28.1%	20.9%	7.5%	12.3%	22.0%	17.1%
2004	-5.2%	4.2%	1.9%	1.5%	-3.0%	7.3%	8.0%	14.1%	12.2%	4.3%	1.6%	3.5%	8.9%	27.6%	21.3%	4.7%	-7.5%	27.8%	17.0%
2005	-5.8%	3.8%	1.4%	0.8%	-3.6%	6.5%	7.7%	17.1%	13.6%	2.5%	4.5%	4.2%	12.5%	30.0%	23.5%	4.3%	24.4%	34.3%	19.7%
2006(f)	-5.2%	2.2%	2.4%	1.5%	-1.8%	4.6%	6.1%	22.4%	20.5%	-3.3%	-6.6%	-1.2%	12.7%	-8.8%	-7.1%	3.4%	29.6%	28.6%	16.8%
2007(f)	-5.2%	2.1%	2.7%	1.6%	-1.7%	5.0%	6.2%	22.9%	21.0%	-3.2%	-6.9%	-0.4%	14.3%	-8.4%	-7.5%	3.1%	30.5%	28.7%	18.2%
2008(f)	-4.7%	2.1%	3.4%	2.1%	-1.5%	5.7%	6.4%	20.7%	19.8%	-1.2%	-6.1%	2.7%	23.0%	1.0%	-3.3%	4.5%	28.0%	26.3%	17.2%
2009(f)	-4.3%	2.0%	3.5%	2.3%	-1.4%	6.1%	6.5%	20.4%	19.8%	-0.5%	-6.2%	3.8%	26.4%	3.7%	-2.3%	4.8%	28.2%	26.1%	17.2%
2010(f)	-4.4%	2.0%	3.8%	2.7%	-1.4%	6.5%	6.9%	20.1%	20.4%	0.5%	-6.4%	5.1%	30.3%	6.6%	-1.7%	4.9%	28.7%	25.9%	16.7%
2011(f)	-4.4%	2.0%	4.2%	3.1%	-1.4%	6.9%	7.2%	19.6%	20.7%	1.8%	-6.6%	6.5%	34.6%	10.2%	-0.8%	5.0%	29.0%	25.6%	16.1%

Dollar Exchange Rates (quoted according to market conventions, period average)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la	WTI
2000	1.00	1.49	107.8	0.92	1.52	1.69	9.16	8.80	28.1	1130.4	8.28	31.23	7.79	1.72	3.80	8422	3.67	3.75	680	**29.0**
2001	1.00	1.55	121.5	0.90	1.44	1.69	10.33	8.99	29.2	1290.8	8.28	33.81	7.80	1.79	3.80	10261	3.67	3.75	724	**25.2**
2002	1.00	1.57	125.4	0.94	1.50	1.56	9.74	7.98	31.3	1251.6	8.28	34.58	7.80	1.79	3.80	9311	3.67	3.75	1161	**22.7**
2003	1.00	1.40	115.9	1.13	1.63	1.35	8.09	7.08	30.7	1191.6	8.28	34.42	7.79	1.74	3.80	8577	3.67	3.75	1607	**27.4**
2004	1.00	1.30	108.2	1.24	1.83	1.24	7.35	6.74	28.8	1146.2	8.19	33.43	7.79	1.69	3.80	8939	3.67	3.75	1891	**37.5**
2005	1.00	1.21	110.2	1.24	1.82	1.24	7.47	6.44	28.3	1024.3	7.97	32.18	7.78	1.66	3.79	9705	3.67	3.75	2090	**52.4**
2006(f)	1.00	1.13	116.3	1.26	1.84	1.25	7.38	6.41	27.2	955.0	7.97	32.52	7.77	1.59	3.67	9167	3.67	3.75	2147	**66.3**
2007(f)	1.00	1.16	114.1	1.34	1.95	1.19	6.66	5.99	25.5	941.0	7.50	32.32	7.80	1.51	3.50	9344	3.67	3.75	2199	**69.0**
2008(f)	1.00	1.00	90.0	1.50	1.90	1.00	5.71	4.67	25.1	925.0	7.00	31.75	7.80	1.47	3.50	9500	3.67	3.75	2350	**40.0**
2009(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	27.8	900.0	7.00	30.87	7.64	1.49	3.39	9175	3.67	3.75	2235	**40.0**
2010(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	30.4	900.0	7.00	29.99	7.49	1.50	3.27	8851	3.67	3.75	2121	**40.0**
2011(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	33.1	900.0	7.00	29.11	7.33	1.52	3.16	8526	3.67	3.75	2006	**40.0**

Real Effective Exchange Rate Index (period average, percentage change relative to 2006 base year)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	9%	-21%	34%	-13%	-5%	-2%	4%	-9%	-41%	-20%	4%	12%	20%	2%	-2%	-30%	-6%	10%	31%
2001	16%	-24%	19%	-13%	-7%	0%	-4%	-5%	-29%	-25%	9%	7%	20%	1%	4%	-33%	3%	14%	37%
2002	17%	-24%	12%	-11%	-6%	4%	-2%	2%	-28%	-21%	7%	4%	16%	-1%	4%	-18%	4%	13%	2%
2003	8%	-16%	15%	-1%	-7%	5%	5%	3%	-26%	-18%	2%	-1%	9%	-2%	0%	-10%	-2%	7%	-8%
2004	3%	-11%	17%	2%	0%	4%	6%	-2%	-19%	-17%	1%	-1%	3%	-2%	-4%	-14%	-4%	2%	-8%
2005	1%	-5%	10%	1%	-1%	3%	1%	1%	-10%	-7%	1%	2%	0%	-3%	-4%	-15%	-1%	-2%	-7%
2006(f)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007(f)	-2%	-4%	-3%	2%	1%	-1%	5%	2%	8%	-2%	4%	-2%	-3%	2%	2%	-1%	-2%	-1%	11%
2008(f)	-12%	10%	17%	7%	-10%	8%	12%	23%	5%	-7%	5%	-8%	-8%	-1%	-3%	-6%	-9%	-5%	18%
2009(f)	-13%	10%	15%	6%	-5%	7%	12%	22%	0%	-4%	4%	-6%	-4%	-3%	0%	2%	-8%	-5%	45%
2010(f)	-14%	10%	13%	6%	-6%	7%	12%	23%	-4%	-4%	3%	-4%	-1%	-6%	3%	10%	-7%	-4%	78%
2011(f)	-15%	10%	10%	6%	-6%	6%	13%	24%	-7%	-4%	2%	-2%	4%	-8%	7%	19%	-6%	-3%	119%

Trade Balances in % of GDP

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	-3.9%	5.8%	1.4%	0.2%	-2.0%	5.7%	5.9%	17.5%	20.0%	3.2%	2.0%	2.2%	4.5%	13.6%	20.0%	10.5%	21.8%	18.8%	11.6%
2001	-3.6%	5.7%	0.6%	1.1%	-2.7%	4.4%	6.5%	17.2%	12.7%	2.3%	1.7%	5.2%	4.5%	15.1%	18.4%	8.1%	14.8%	15.8%	3.3%
2002	-4.1%	4.4%	1.3%	2.1%	-2.9%	6.4%	6.7%	13.6%	10.8%	1.4%	2.1%	7.2%	8.3%	16.9%	18.3%	6.2%	11.3%	17.4%	12.3%
2003	-4.6%	3.7%	1.6%	1.5%	-2.7%	6.6%	6.5%	13.3%	11.3%	2.4%	1.5%	7.5%	9.2%	28.1%	20.9%	7.5%	12.3%	22.0%	17.1%
2004	-5.2%	4.2%	1.9%	1.5%	-3.0%	7.3%	8.0%	14.1%	12.2%	4.3%	1.6%	3.5%	8.9%	27.6%	21.3%	4.7%	-7.5%	27.8%	17.0%
2005	-5.8%	3.8%	1.4%	0.8%	-3.6%	6.5%	7.7%	17.1%	13.6%	2.5%	4.5%	4.2%	12.5%	30.0%	23.5%	4.3%	24.4%	34.3%	19.7%
2006(f)	-5.2%	2.2%	2.4%	1.5%	-1.8%	4.6%	6.1%	22.4%	20.5%	-3.3%	-6.6%	-1.2%	12.7%	-8.8%	-7.1%	3.4%	29.6%	28.6%	16.8%
2007(f)	-5.2%	2.1%	2.7%	1.6%	-1.7%	5.0%	6.2%	22.9%	21.0%	-3.2%	-6.9%	-0.4%	14.3%	-8.4%	-7.5%	3.1%	30.5%	28.7%	18.2%
2008(f)	-3.9%	2.8%	4.3%	2.6%	-0.9%	6.3%	7.1%	15.7%	15.8%	2.3%	-3.9%	7.7%	36.3%	19.9%	5.6%	7.1%	21.0%	20.9%	13.7%
2009(f)	-2.8%	2.6%	4.2%	2.8%	-0.9%	6.6%	7.1%	14.9%	16.2%	3.1%	-4.0%	9.2%	40.9%	23.3%	6.9%	7.7%	21.7%	20.9%	13.8%
2010(f)	-2.6%	2.6%	4.5%	3.2%	-0.8%	7.0%	7.4%	15.0%	16.9%	3.9%	-4.1%	10.6%	45.0%	27.1%	7.8%	7.8%	22.4%	20.9%	13.4%
2011(f)	-2.5%	2.6%	4.9%	3.6%	-0.8%	7.5%	7.8%	15.0%	17.4%	4.8%	-4.3%	12.0%	49.2%	31.1%	8.6%	8.0%	23.0%	20.8%	13.0%

Dollar Exchange Rates (quoted according to market conventions, period average)

	US	Canada	Japan	Euroland	UK	Switzerland	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Indonesia	UAE	Saudia Arabia	Venezuela	WTI
2000	1.00	1.49	107.8	0.92	1.52	1.69	9.16	8.80	28.1	1130.4	8.28	31.23	7.79	1.72	3.80	8422	3.67	3.75	680	**29.0**
2001	1.00	1.55	121.5	0.90	1.44	1.69	10.33	8.99	29.2	1290.8	8.28	33.81	7.80	1.79	3.80	10261	3.67	3.75	724	**25.2**
2002	1.00	1.57	125.4	0.94	1.50	1.56	9.74	7.98	31.3	1251.6	8.28	34.58	7.80	1.79	3.80	9311	3.67	3.75	1161	**22.7**
2003	1.00	1.40	115.9	1.13	1.63	1.35	8.09	7.08	30.7	1191.6	8.28	34.42	7.79	1.74	3.80	8577	3.67	3.75	1607	**27.4**
2004	1.00	1.30	108.2	1.24	1.83	1.24	7.35	6.74	28.8	1146.2	8.19	33.43	7.79	1.69	3.80	8939	3.67	3.75	1891	**37.5**
2005	1.00	1.21	110.2	1.24	1.82	1.24	7.47	6.44	28.3	1024.3	7.97	32.18	7.78	1.66	3.79	9705	3.67	3.75	2090	**52.4**
2006(f)	1.00	1.13	116.3	1.26	1.84	1.25	7.38	6.41	27.2	955.0	7.97	32.52	7.77	1.59	3.67	9167	3.67	3.75	2147	**66.3**
2007(f)	1.00	1.16	114.1	1.34	1.95	1.19	6.66	5.99	25.5	941.0	7.50	32.32	7.80	1.51	3.50	9344	3.67	3.75	2199	**69.0**
2008(f)	1.00	1.00	90.0	1.50	1.90	1.00	5.71	4.67	25.1	925.0	7.00	31.75	7.80	1.47	3.50	9500	3.67	3.75	2350	**59.5**
2009(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	27.8	900.0	7.00	30.87	7.64	1.49	3.39	9175	3.67	3.75	2235	**59.6**
2010(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	30.4	900.0	7.00	29.99	7.49	1.50	3.27	8851	3.67	3.75	2121	**59.9**
2011(f)	1.00	1.00	90.0	1.50	2.00	1.00	5.71	4.67	33.1	900.0	7.00	29.11	7.33	1.52	3.16	8526	3.67	3.75	2006	**59.8**

Real Effective Exchange Rate Index (period average, percentage change relative to 2006 base year)

	US	Canada	Japan	Euroland	UK	Switzerland	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Indonesia	UAE	Saudia Arabia	Venezuela
2000	9%	-21%	34%	-13%	-5%	-2%	4%	-9%	-41%	-20%	4%	12%	20%	2%	-2%	-30%	-6%	10%	31%
2001	16%	-24%	19%	-13%	-7%	0%	-4%	-5%	-29%	-25%	9%	7%	20%	1%	4%	-33%	3%	14%	37%
2002	17%	-24%	12%	-11%	-6%	4%	-2%	2%	-28%	-21%	7%	4%	16%	-1%	4%	-18%	4%	13%	2%
2003	8%	-16%	15%	-1%	-7%	5%	5%	3%	-26%	-18%	2%	-1%	9%	-2%	0%	-10%	-2%	7%	-8%
2004	3%	-11%	17%	2%	0%	4%	6%	-2%	-19%	-17%	1%	-1%	3%	-2%	-4%	-14%	-4%	2%	-8%
2005	1%	-5%	10%	1%	-1%	3%	1%	1%	-10%	-7%	1%	2%	0%	-3%	-4%	-15%	-1%	-2%	-7%
2006(f)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007(f)	-2%	-4%	-3%	2%	1%	-1%	5%	2%	8%	-2%	4%	-2%	-3%	2%	2%	-1%	-2%	-1%	11%
2008(f)	-12%	10%	17%	7%	-10%	8%	12%	23%	5%	-7%	5%	-8%	-8%	-1%	-3%	-6%	-9%	-5%	18%
2009(f)	-13%	10%	15%	6%	-5%	7%	12%	22%	0%	-4%	4%	-6%	-4%	-3%	0%	2%	-8%	-5%	45%
2010(f)	-14%	10%	13%	6%	-6%	7%	12%	23%	-4%	-4%	3%	-4%	-1%	-6%	3%	10%	-7%	-4%	78%
2011(f)	-15%	10%	10%	6%	-6%	6%	13%	24%	-7%	-4%	2%	-2%	4%	-8%	7%	19%	-6%	-3%	119%

Trade Balances in % of GDP

	US	Canada	Japan	Euroland	UK	Switzerland	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapore	Malaysia	Indonesia	UAE	Saudia Arabia	Venezuela
2000	-3.9%	5.8%	1.4%	0.2%	-2.0%	5.7%	5.9%	17.5%	20.0%	3.2%	2.0%	2.2%	4.5%	13.6%	20.0%	10.5%	21.8%	18.8%	11.6%
2001	-3.6%	5.7%	0.6%	1.1%	-2.7%	4.4%	6.5%	17.2%	12.7%	2.3%	1.7%	5.2%	4.5%	15.1%	18.4%	8.1%	14.8%	15.8%	3.3%
2002	-4.1%	4.4%	1.3%	2.1%	-2.9%	6.4%	6.7%	13.6%	10.8%	1.4%	2.1%	7.2%	8.3%	16.9%	18.3%	6.2%	11.3%	17.4%	12.3%
2003	-4.6%	3.7%	1.6%	1.5%	-2.7%	6.6%	6.5%	13.3%	11.3%	2.4%	1.5%	7.5%	9.2%	28.1%	20.9%	7.5%	12.3%	22.0%	17.1%
2004	-5.2%	4.2%	1.9%	1.5%	-3.0%	7.3%	8.0%	14.1%	12.2%	4.3%	1.6%	3.5%	8.9%	27.6%	21.3%	4.7%	-7.5%	27.8%	17.0%
2005	-5.8%	3.8%	1.4%	0.8%	-3.6%	6.5%	7.7%	17.1%	13.6%	2.5%	4.5%	4.2%	12.5%	30.0%	23.5%	4.3%	24.4%	34.3%	19.7%
2006(f)	-5.2%	2.2%	2.4%	1.5%	-1.8%	4.6%	6.1%	22.4%	20.5%	-3.3%	-6.6%	-1.2%	12.7%	-8.8%	-7.1%	3.4%	29.6%	28.6%	16.8%
2007(f)	-5.2%	2.1%	2.7%	1.6%	-1.7%	5.0%	6.2%	22.9%	21.0%	-3.2%	-6.9%	-0.4%	14.3%	-8.4%	-7.5%	3.1%	30.5%	28.7%	18.2%
2008(f)	-4.6%	2.1%	3.4%	2.1%	-1.5%	5.7%	6.4%	20.7%	19.8%	-1.2%	-6.1%	2.7%	23.1%	1.0%	-3.3%	4.5%	28.0%	26.3%	17.2%
2009(f)	-3.5%	2.0%	3.3%	2.3%	-1.5%	6.0%	6.5%	19.7%	20.2%	-0.4%	-6.2%	4.1%	27.4%	4.1%	-2.2%	5.0%	28.7%	26.3%	17.3%
2010(f)	-3.4%	2.0%	3.6%	2.7%	-1.4%	6.4%	6.8%	19.8%	20.9%	0.3%	-6.4%	5.4%	31.4%	7.4%	-1.4%	5.1%	29.4%	26.3%	16.8%
2011(f)	-3.2%	2.0%	3.9%	3.1%	-1.3%	6.8%	7.1%	19.8%	21.4%	1.2%	-6.6%	6.9%	35.7%	11.2%	-0.5%	5.3%	30.0%	26.1%	16.2%

US Domestic Demand

% yoy	Recession	Base case
2000	4.4	4.4
2001	0.9	0.9
2002	2.2	2.2
2003	2.8	2.8
2004	4.4	4.4
2005	3.3	3.3
2006(f)	3.2	3.2
2007(f)	1.7	1.7
2008(f)	-1.0	2.1
2009(f)	1.0	2.8
2010(f)	1.0	2.8
2011(f)	1.0	2.8

Oil Prices

$/bbl	WTI
2000	29.0
2001	25.2
2002	22.7
2003	27.4
2004	37.5
2005	52.4
2006(f)	66.3
2007(f)	69.0
2008(f)	40.0
2009(f)	40.0
2010(f)	40.0
2011(f)	40.0

Dollar Exchange Rates (quoted according to market conventions, period average)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	1.00	1.49	107.8	0.92	1.52	1.69	9.16	8.80	28.1	1130.4	8.28	31.23	7.79	1.72	3.80	8422	3.67	3.75	680
2001	1.00	1.55	121.5	0.90	1.44	1.69	10.33	8.99	29.2	1290.8	8.28	33.81	7.80	1.79	3.80	10261	3.67	3.75	724
2002	1.00	1.57	125.4	0.94	1.50	1.56	9.74	7.98	31.3	1251.6	8.28	34.58	7.80	1.79	3.80	9311	3.67	3.75	1161
2003	1.00	1.40	115.9	1.13	1.63	1.35	8.09	7.08	30.7	1191.6	8.28	34.42	7.79	1.74	3.80	8577	3.67	3.75	1607
2004	1.00	1.30	108.2	1.24	1.83	1.24	7.35	6.74	28.8	1146.2	8.19	33.43	7.79	1.69	3.80	8939	3.67	3.75	1891
2005	1.00	1.21	110.2	1.24	1.82	1.24	7.47	6.44	28.3	1024.3	7.97	32.18	7.78	1.66	3.79	9705	3.67	3.75	2090
2006(f)	1.00	1.13	116.3	1.26	1.84	1.25	7.38	6.41	27.2	955.0	7.97	32.52	7.77	1.59	3.67	9167	3.67	3.75	2147
2007(f)	1.00	1.16	114.1	1.34	1.95	1.19	6.66	5.99	25.5	941.0	7.61	32.32	7.80	1.51	3.50	9344	3.67	3.75	2199
2008(f)	1.00	1.16	105.0	1.37	1.90	1.15	6.42	5.69	25.1	925.0	7.41	31.75	7.80	1.47	3.50	9500	3.67	3.75	2350
2009(f)	1.00	1.16	106.3	1.31	1.79	1.19	6.71	5.47	27.8	1045.0	7.27	30.87	7.64	1.49	3.39	9175	3.67	3.75	2235
2010(f)	1.00	1.15	107.7	1.24	1.68	1.23	6.99	5.25	30.4	1165.0	7.13	29.99	7.49	1.50	3.27	8851	3.67	3.75	2121
2011(f)	1.00	1.15	109.0	1.18	1.57	1.26	7.28	5.03	33.1	1285.0	6.99	29.11	7.33	1.52	3.16	8526	3.67	3.75	2006

Real Effective Exchange Rate Index (period average, percentage change relative to 2006 base year)

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	9%	-21%	34%	-13%	-5%	-2%	4%	-9%	-41%	-20%	4%	12%	20%	2%	-2%	-30%	-6%	10%	31%
2001	16%	-24%	19%	-13%	-7%	0%	-4%	-5%	-29%	-25%	9%	7%	20%	1%	4%	-33%	3%	14%	37%
2002	17%	-24%	12%	-11%	-6%	4%	-2%	2%	-28%	-21%	7%	4%	16%	-1%	4%	-18%	4%	13%	2%
2003	8%	-16%	15%	-1%	-7%	5%	5%	3%	-26%	-18%	2%	-1%	9%	-2%	0%	-10%	-2%	7%	-8%
2004	3%	-11%	17%	2%	0%	4%	6%	-2%	-19%	-17%	1%	-1%	3%	-2%	-4%	-14%	-4%	2%	-8%
2005	1%	-5%	10%	1%	-1%	3%	1%	1%	-10%	-7%	1%	2%	0%	-3%	-4%	-15%	-1%	-2%	-7%
2006(f)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007(f)	-2%	-4%	-2%	2%	1%	-1%	5%	2%	8%	-1%	3%	-2%	-3%	2%	2%	-1%	-2%	0%	11%
2008(f)	-4%	-4%	3%	2%	-3%	0%	7%	7%	13%	-2%	3%	-3%	-3%	3%	0%	-1%	-3%	-1%	20%
2009(f)	-4%	-3%	1%	0%	-7%	0%	6%	17%	12%	-13%	7%	0%	1%	2%	5%	9%	1%	2%	48%
2010(f)	-3%	-2%	-1%	-4%	-11%	1%	4%	28%	11%	-21%	11%	3%	5%	1%	10%	20%	5%	4%	83%
2011(f)	-3%	-2%	-3%	-7%	-15%	2%	3%	40%	12%	-29%	14%	7%	9%	-1%	16%	32%	10%	7%	127%

Trade Balances in % of GDP

	US	Canada	Japan	Eurolan d	UK	Switzerl and	Sweden	Norway	Russia	Korea	China	Taiwan	Hong Kong	Singapo re	Malaysia	Indonesi a	UAE	Saudia Arabia	Venezue la
2000	-3.9%	5.8%	1.4%	0.2%	-2.0%	5.7%	5.9%	17.5%	20.0%	3.2%	2.0%	2.2%	4.5%	13.6%	20.0%	10.5%	21.8%	18.8%	11.6%
2001	-3.6%	5.7%	0.6%	1.1%	-2.7%	4.4%	6.5%	17.2%	12.7%	2.3%	1.7%	5.2%	4.5%	15.1%	18.4%	8.1%	14.8%	15.8%	3.3%
2002	-4.1%	4.4%	1.3%	2.1%	-2.9%	6.4%	6.7%	13.6%	10.8%	1.4%	2.1%	7.2%	8.3%	16.9%	18.3%	6.2%	11.3%	17.4%	12.3%
2003	-4.6%	3.7%	1.6%	1.5%	-2.7%	6.6%	6.5%	13.3%	11.3%	2.4%	1.5%	7.5%	9.2%	28.1%	20.9%	7.5%	12.3%	22.0%	17.1%
2004	-5.2%	4.2%	1.9%	1.5%	-3.0%	7.3%	8.0%	14.1%	12.2%	4.3%	1.6%	3.5%	8.9%	27.6%	21.3%	4.7%	-7.5%	27.8%	17.0%
2005	-5.8%	3.8%	1.4%	0.8%	-3.6%	6.5%	7.7%	17.1%	13.6%	2.5%	4.5%	4.2%	12.5%	30.0%	23.5%	4.3%	24.4%	34.3%	19.7%
2006(f)	-5.2%	2.2%	2.4%	1.5%	-1.8%	4.6%	6.1%	22.4%	20.5%	-3.3%	-6.6%	-1.2%	12.7%	-8.8%	-7.1%	3.4%	29.6%	28.6%	16.8%
2007(f)	-5.2%	2.1%	2.7%	1.6%	-1.7%	5.0%	6.2%	22.9%	21.0%	-3.2%	-6.9%	-0.4%	14.3%	-8.4%	-7.5%	3.1%	30.5%	28.7%	18.2%
2008(f)	-4.0%	2.8%	4.3%	2.6%	-0.9%	6.3%	7.1%	15.7%	15.8%	2.3%	-3.9%	7.7%	36.2%	19.9%	5.6%	7.1%	21.0%	20.9%	13.7%
2009(f)	-3.3%	2.2%	4.4%	2.7%	-1.0%	6.6%	7.1%	15.5%	16.0%	2.9%	-4.0%	8.8%	39.5%	22.3%	6.4%	7.5%	21.3%	20.7%	13.8%
2010(f)	-3.1%	1.9%	4.8%	3.1%	-1.0%	7.0%	7.4%	15.2%	16.5%	4.1%	-4.2%	10.0%	43.4%	25.5%	7.0%	7.5%	21.8%	20.6%	13.5%
2011(f)	-2.9%	1.7%	5.1%	3.4%	-1.0%	7.4%	7.7%	14.9%	16.9%	5.4%	-4.4%	11.3%	47.4%	29.0%	7.6%	7.5%	22.2%	20.4%	13.1%