



# New Tool Gauges Impact of Exchange Rates on States

By Keith R. Phillips, Steve Brzezinski and Barbara Davalos

*The RTWVD index will allow analysts to more precisely identify the exchange rates that most affect a state's economy.*

International trade has grown considerably over the past three decades—U.S. exports as a share of gross domestic product totaled 12.7 percent in 2008, up from 9.7 percent in 1980. This expansion has heightened awareness of exchange rate movements and their impact on state economies.

States with relatively more employment tied to international trade are increasingly likely to be sensitive to exchange rate movements.<sup>1</sup> If a significant share of Texas jobs is tied to the manufacture of products sent to Mexico and the value of the peso drops sharply—as it did in 1994 following the Mexican presidential election—Texas might suffer as shipments south of the border decline.

National exchange rate indexes do not always reflect individual state experiences. States at times face sharply different effective exchange rate shifts, often provoked by economic or financial crises.

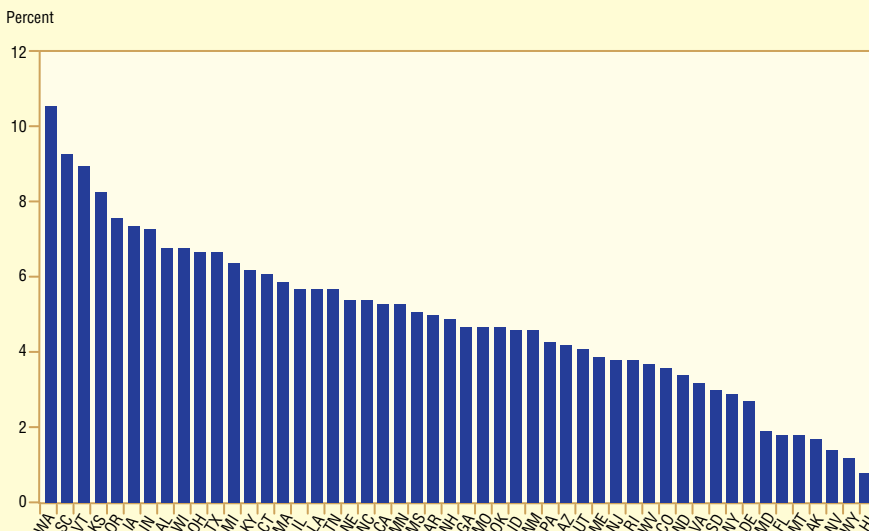
Analysts need a tool to more effectively gauge the sometimes varied impact of exchange rate movements on states. In past research, the Federal Reserve Bank of Dallas built a real exchange rate gauge known as the Texas Value of the Dollar Index and found it to be a significant leading indicator of the state's economy.<sup>2</sup> This index compares the value of the dollar against the currencies of countries with which the state trades. In this article, we introduce a similar measure for all 50 states—the real trade-weighted value of the dollar (RTWVD) index.

In 2006, before the recent financial crisis, the five states with the largest share of jobs tied to exports were Washington (10.6 percent), South Carolina (9.3 percent), Vermont (9 percent), Kansas (8.3 percent) and Oregon (7.6 percent), U.S. Census Bureau data show (*Chart 1*).<sup>3</sup> The states with the smallest shares were Montana (1.8 percent), Alaska (1.7 percent), Nevada (1.4 percent), Wyoming (1.2 percent) and Hawaii (0.8 percent). The differences among states can be attributed to the presence of exporting industries and manufacturing's share of overall output.

In Washington, where manufacturing as a share of output ranked 30th, transportation equipment is a large industry and big exporter, representing more than half of what's sent abroad. The other leaders rank among the top half of states in manufacturing as a share of total output. Manufacturing plays a lesser role in states where export-related jobs are a small share of private employment; the five states with the fewest export-related jobs rank at the bottom for manufacturing as a share of output.

To assess the impact of exchange rates on states, the RTWVD weights the U.S. dollar exchange rate with various countries based on a state's share of exports. It is a "real" measure because it adjusts the exchange rate for different rates of inflation. The index will allow analysts to more precisely identify the exchange rates that most affect a state's economy.

**Chart 1**  
**Importance of Exports to Jobs Varies Across States**  
(Export-related jobs as a share of total private-sector jobs, 2006)



SOURCE: U.S. Census Bureau, Manufacturing and Construction Division.

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## Calculating State Exchange Rates

To produce the state measures, real exchange rates between the U.S. and its trading partners were created. State-specific measures were then formed by weighting the real exchange rates by the percentage of the state's exports sent to specific countries. For example, historically, about 45 percent of Texas exports have gone to Mexico, so the real value of the peso is multiplied by 0.45 to calculate the state's RTWVD.

The index is adjusted for each country's inflation rate so that it best represents the purchasing power of the dollar relative to the foreign currency. The Census Bureau's Origin of Movement series, produced by the Foreign Trade Division, is a primary data source. The series is available quarterly back to 1987 and contains current-year export sales from all 50 states to 242 foreign destinations. For a fuller discussion of export data, see the box, "Estimating State Exports: Data Challenges."

A data series showing U.S. exchange rates and the consumer price indexes (CPIs) of the U.S. and its trading partners is used to construct real exchange rates. The data are from the International Monetary Fund's International Financial Statistics program. For the most recent periods, which are unavailable from IMF, the figures are from the Federal Reserve Board of Governors and the Pacific Exchange Rate Service at the University of British Columbia.

A monthly real trade-weighted value of the dollar for each state is obtained using a calculation that can be roughly viewed as the weighted sum of the real exchange rates for the countries receiving a state's exports:

$$RTWVD_t^s = \sum_{j=1}^{25} [(C_{jt}/USD_t) \times (USCPI_t/CPI_{jt}) \times (\text{Exports}_j^s / \text{Exports}^s)],$$

where  $RTWVD_t^s$  is the real trade-weighted value of the dollar for state  $s$  at time  $t$ . The first two ratios in the equation measure the real exchange rate by multiplying the exchange rate, measured as currency of country  $j$  ( $C_{jt}$ ) per dollar ( $USD_t$ ), times the U.S. consumer price index ( $USCPI_t$ ) divided by the price index of country  $j$  ( $CPI_{jt}$ ). To ensure that the real exchange rates are comparable across states, the values for all countries are indexed to equal 100 in June 1995. The indexed real exchange rate is then multiplied by the share of exports from state  $s$  sent to country  $j$  ( $\text{Exports}_j^s / \text{Exports}^s$ ). The export weights are based on average exports from 1997 to 2008.<sup>4</sup>

## Comparing Index Values

The West South Central states and U.S. indexes, produced by the Federal Reserve Board of Governors, illustrate the differing movements in the RTWVD (*Chart 2*). The state indexes generally are highly correlated with one another and with the U.S. RTWVD. The index for Texas displays an interesting exception between 1998 and 2001. The series did not increase because Texas exports heavily to Mexico, and the real value of the peso strengthened against the dollar over this period. The RTWVD for Arizona, Mississippi and Tennessee also did not rise as much as the U.S. index during this period because these states ship a significant share of their exports to Mexico. Because Canada is the largest U.S. trading partner, the weakening of the Canadian dollar relative to the U.S. currency helps explain the U.S. RTWVD increase.

Next, the variance in the year-over-year

## Estimating State Exports: Data Challenges

The state export data used to create the weights for the RTWVDs come from the Origin of Movement (OM) series compiled by the Census Bureau's Foreign Trade Division. They differ from data used by the Census Bureau to create the employment shares shown in Chart 1. The data in that graphic, which the Census refers to as "Exports from Manufacturing Establishments," measure the Origin of Production (OP) of exports but cannot be used for trade shares because they do not include the destination of exports.

A weakness of the OM series is that exports are designated to a state based on where they began their journey, not where production occurred. The location where an export begins its journey can differ from the production location in several ways. If a company combines several export products together or stores products in off-site warehouses before export, then the state where the consolidation or storage takes place is assigned the exports. Also, the exports of a wholesale or retail company are assigned to its home state, which may not be the location where the products were manufactured. Additionally, the value of the export is measured at the port of shipment and includes domestic shipping costs, inflating the value of goods shipped from the interior of the country.

Despite the issues of consolidation and transportation costs, a recent study found that these two main sources of distortion tend to offset each other.<sup>i</sup> The study concludes that the OM data series as a whole may be considered a good representation of the OP series, although exports in some port states are overestimated and the data from small states are measured with the greatest percentage errors. While these criticisms are important, in general they aren't directly related to the use of the series as export share weights. For example, exports from port states may be inflated, but that does not necessarily mean that the shares of their exports by country are distorted. This is a more difficult question left for further study.<sup>ii</sup>

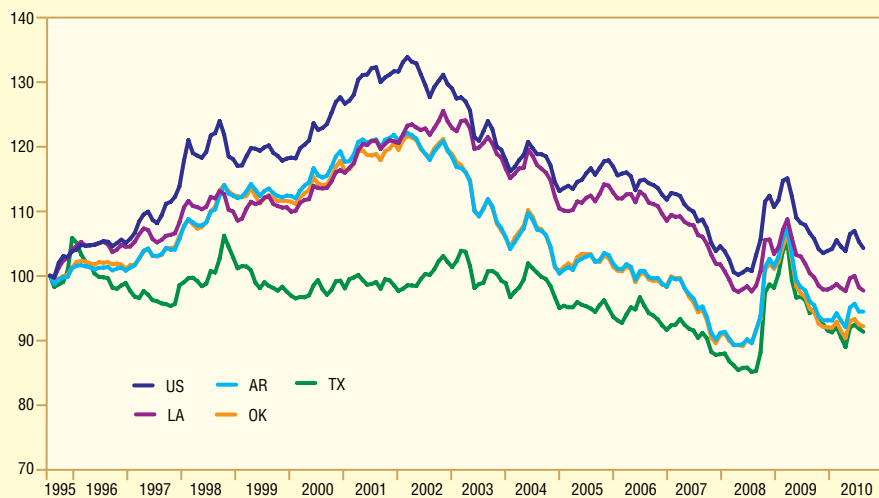
### NOTES:

<sup>i</sup> Much of the information in this box is summarized from "State Export Data: Origin of Movement vs. Origin of Production," by Andrew J. Cassey, *Journal of Economic and Social Measurement*, vol. 34, no. 4, 2009, pp. 241–68.

<sup>ii</sup> Historically, a weakness of the OM data involved the volume of U.S. exports not designated to any state. The Census Bureau and Customs and Border Protection require exporters to provide the information used to compile the OM data through the Shipper's Export Declaration. In the early years of the OM series, exporters often left blank the origin of movement question. Beginning in 1988, the Census Bureau allowed the Massachusetts Institute for Social and Economic Research (MISER), now the World Institute for Strategic Economic Research (WISER), to estimate the origin of movement of incomplete forms using an algorithm. However, with the introduction of electronic filing of the declaration, the compliance rate increased sharply and the raw data haven't been adjusted since 2000.

**Chart 2**  
**RTWVDs for the West South Central States and U.S.**

Index, June 1995 = 100



SOURCES: International Monetary Fund; Federal Reserve Board of Governors; Pacific Exchange Rate Service, University of British Columbia; Census Bureau; authors' calculations.

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percent change is calculated across the state indexes for every month in the sample to summarize movements for all 50 states. This change places the focus on broader index movements. If the variance were low and consistent over time, calculating separate indexes for each state wouldn't be useful because the changes in the U.S. RTWVD would sufficiently represent movements of each state.

However, states have experienced quite different exchange rate movements since mid-1996, particularly during three distinct periods. Variances peaked in January 1998, February 2003 and November 2008 (*Chart 3*).

A closer examination of state RTWVDs at these points helps explain the main factors behind some of the sharp historical deviations in exchange rates across states. In 1998, states exhibiting the largest year-over-year percent change in RTWVD were Alaska, California, Hawaii, Idaho, Maine, New Mexico, Oregon and Wyoming. These states experienced an average increase of 12.4 percent from December 1997 to August 1998 (*Chart 4*). By looking at changes in the real exchange rate between these states and their trading partners, we can better understand why the states deviated significantly from their peers.

During 1998, the Asian financial crisis caused the dollar to appreciate relative to most East Asian currencies. The eight states that experienced the largest year-over-year changes in RTWVD traded extensively with

Thailand, Indonesia, South Korea, the Philippines, Hong Kong, Malaysia, Singapore and China. These states shipped an average of 46 percent of their total exports to East Asia, representing 53 percent of all U.S. exports to the region.

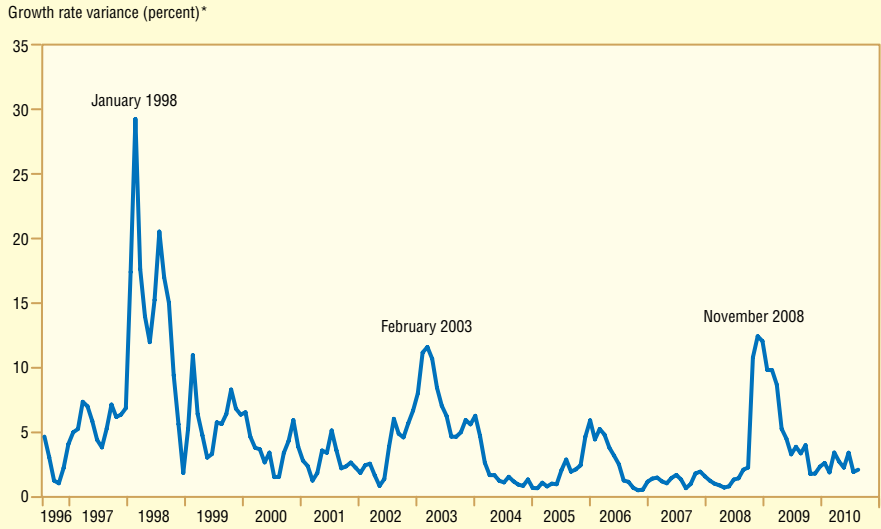
The sharp increase in the 2003 variance can be explained primarily by an 11 percent year-over-year change in Florida's RTWVD (*Chart 5*). Brazil is Florida's largest trading partner. In 2003, 14 percent of Florida's exports were shipped to the country, representing 23 percent of all U.S. exports to Brazil. Computers and electronic products and transportation equipment accounted for about 70 percent of the exports. Thus, a sharp depreciation of the Brazilian *real* against the dollar amid fears of default following the 2003 Argentinean debt crisis helps explain this episode.

The change in the variance attributable to the Brazilian currency crisis is significantly smaller than the change following the Asian financial crisis in 1998. Brazil's currency woes were relatively milder, with far less global impact. The U.S. also trades much more heavily with East Asia than Brazil.

The third episode, with its peak in November 2008, can be attributed to the global financial crisis that began in the U.S. in late 2007. Between December 2007 and November 2008, 42 states experienced an average year-over-year increase of 14.5 percent in RTWVD. The dollar appreciated against a

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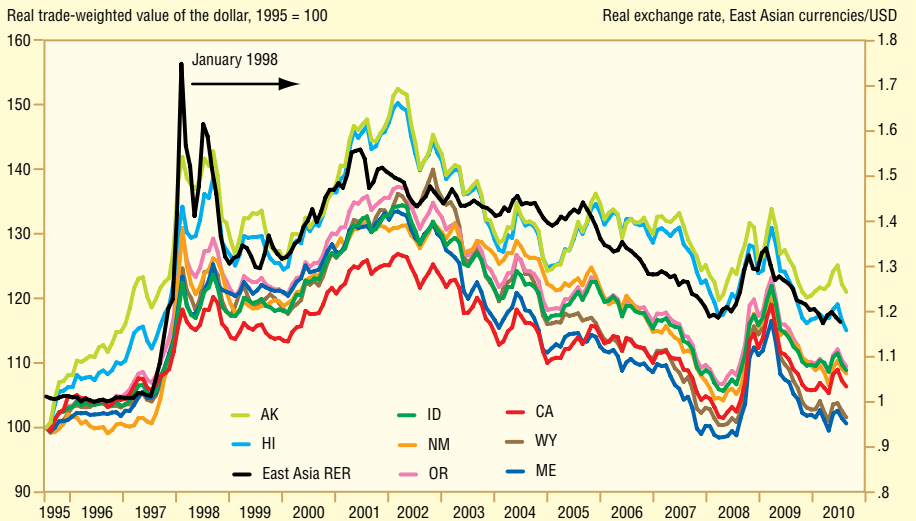
**Chart 3**  
**Exchange Rate Movements Vary Across the States**



\*Variance of the year/year percent changes in the state RTWVDs.

SOURCES: International Monetary Fund; Federal Reserve Board of Governors; Pacific Exchange Rate Service, University of British Columbia; Census Bureau; authors' calculations.

**Chart 4**  
**East Asian Crisis Had Big Impact on Many State RTWVDs**



SOURCES: International Monetary Fund; Federal Reserve Board of Governors; Pacific Exchange Rate Service, University of British Columbia; Census Bureau; authors' calculations.

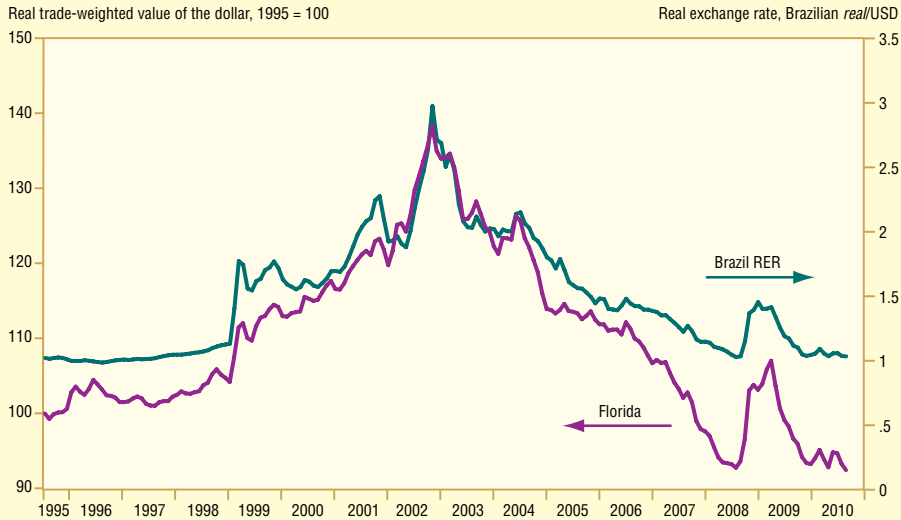
large number of currencies amid a flight to safety during the crisis. Consequently, the trade-weighted value of the dollar rose in all states, with larger increases in states that dealt extensively with developing countries.

### Recent Dollar Movements

The U.S. RTWVD is down sharply from the high reached in March 2009 and close

to prerecession levels of mid-2007 (*Chart 6*). The dollar's rise during the financial crisis likely pressured manufacturers throughout the U.S. as the cost of their products in foreign currencies rose. This price pressure has abated over the past year as the dollar weakened. The year-over-year decline in the dollar has been widely felt across states, as seen in *Chart 3*.

**Chart 5**  
**Real Exchange Rate with Brazil Heavily Influences Florida's RTWVD**



and can lead to a smaller demand for exports. The reverse is true when the dollar depreciates. Some of these effects can be offset by declining costs for imported components and by the exchange rate hedging strategies of exporting companies.

The overall impact of exchange rate movements on a state's economy can be evaluated by examining past movements and how they relate to the state's business cycle or manufacturing output. The state-level RTWVD indexes, which the Dallas Fed will publish monthly, should provide a more precise measure of the exchange rate movements most important to state economies.<sup>5</sup>

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### Notes

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<sup>1</sup> While a state's sensitivity to exchange rates is also affected by its international imports, data on state imports by source country are not available for a consistent time period and less is known about the quality of the data.

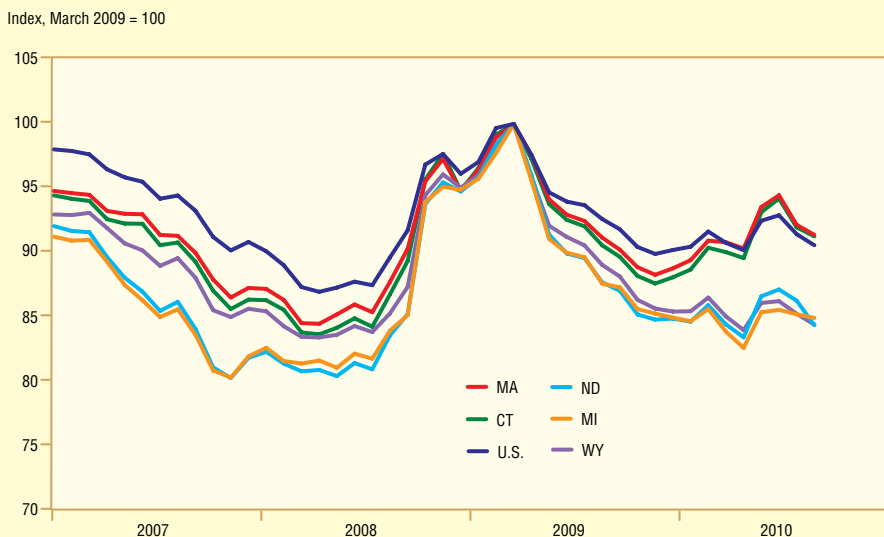
<sup>2</sup> See "The Texas Index of Leading Economic Indicators: A Revision and Further Evaluation," by Keith R. Phillips, Federal Reserve Bank of Dallas *Economic Review*, July 1990.

<sup>3</sup> While data are available for 2008, we use 2006 data because the global financial crisis may have distorted exports for 2008. To access this data, see [www.census.gov/mcd/exports/](http://www.census.gov/mcd/exports/).

<sup>4</sup> Though export data exist for more than 200 countries, CPI information is much more restrictive. The calculation is limited to each state's top 25 export destinations; complete data are used for most states, with 89 percent of exports covered on average. The indexes begin in June 1995 because of insufficient prior CPI data.

<sup>5</sup> The state RTWVD indexes will be published on the Dallas Fed website, [www.dallasfed.org](http://www.dallasfed.org), beginning in March 2011.

**Chart 6**  
**Real Value of Dollar Falls from Peak, Approaches Precrisis Levels**



While the U.S. index fell 9.5 percent from March 2009 to August 2010, Michigan, North Dakota and Wyoming experienced declines of slightly more than 15 percent, while Massachusetts and Connecticut saw declines of less than 9 percent. But these state RTWVDs generally returned to their prerecession levels, as the U.S. index did.

Thus, across the states, exporters for much of this year have likely benefited from

reduced foreign currency prices for their products following the flight to the U.S. dollar.

### A More Precise Measure

RTWVD indexes for each U.S. state afford a view of differing exchange rate movements. As the U.S. dollar appreciates against the currencies of countries to which a state typically exports, products become more expensive for the importing country