

*Th. Jefferson*

# *Climate Change*

June 2009

The Thomas Jefferson Institute  
for Public Policy

Virginia Economic Forecast  
2009-10



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## Foreword

The Thomas Jefferson Institute for Public Policy is proud to present its tenth annual report on the economy of the United States and Virginia. It is part of the foundation's efforts to offer well-researched studies for our state leaders to assist them in better preparing for the future.

This year's annual *Virginia Economic Forecast* was again researched and written by Dr. Christine Chmura and her team of top economists at Chmura Economics & Analytics (Chmura) headquartered in Richmond. Dr. Chmura founded Chmura Economics & Analytics in 1999 after serving as Chief Economist at Crestar Bank (purchased by SunTrust) for seven years. Chmura has since grown into a leading member of its industry, specializing in quantitative research, traditional economics, workforce and economic development, and software design.

"*Virginia Economic Forecast: 2009 – 2010*" is made available to our state's elected leaders, business leaders, and the media in order to assist them in better understanding the economic reality facing our state. This year's edition, titled *Climate Change*, describes the uncertainty around forecasts for climate change and potential policy changes. The *Economic Forecast* details how the recession is expected to unfold in 2009 with the expectation of renewed growth in 2010.

Last year's *Virginia Economic Forecast* anticipated the pace of economic growth to slow compared to the prior year. In 2008, real gross domestic product expanded at a 1.1% pace compared with Chmura's forecast of 1.2%. Chmura's forecast last year expected consumer spending to grow by 1.2% in 2008 rather than the dramatic slowing to 0.2% growth that was recorded. Spurred by the expanding global recession, the trade deficit fell \$156 billion instead of a \$119 billion drop that was projected. The forecast for Virginia also missed the mark on consumer spending. Retail sales fell 5.4% instead of the forecast 0.3% growth in 2008. Employment in the Commonwealth slowed as expected, with no change in 2008 (0.0% on an annual average basis) compared to 0.5% as forecast.

We once again thank SunTrust for sponsoring this year's "*Virginia Economic Forecast: 2009 – 2010*." Nothing in this report should be construed as supporting or opposing any legislation. The opinions are those of the authors and not necessarily those of the Thomas Jefferson Institute, its Board of Directors, or SunTrust as the sponsor of this report.

Michael W. Thompson  
Chairman and President  
Thomas Jefferson Institute for Public Policy  
June 2009



### In the Nation...

• The National Bureau of Economic Research declared that a recession began in December 2007. Real gross domestic product (GDP) contracted at an annualized pace of about 6.0% during the last two quarters (Q4 2008 and Q1 2009) and 2.6% since the recession began. The unemployment rate rose to 8.9% for the first time in 25 years while businesses shed 5.5 million jobs since the recession began in December 2007. The Conference Board's consumer confidence index slumped to 25.0 (Index 1985 = 100) in February 2009, the lowest since it began tracking consumers' expectations about economic growth in 1967. However, this is not a depression, which would be defined by at least a 10% drop in real GDP.

• This recession has been distinct from many in the past because of its origination in the housing market and the dramatic spillover to the financial industry. The severity of the national financial crisis prompted stimulus from both the Federal Reserve Board and the federal government. Signs that the economy is nearing the bottom in this recession are becoming apparent in the growth in the stock market and reduction in the number of layoffs.

• GDP is projected to post slight annualized contractions in the third and fourth quarters of 2009. The recovery is expected to take hold in the first quarter of 2010 as (1) the banking industry continues to improve, (2) the inventory overhang of houses, retail, and manufactured goods is reduced, and (3) the stimulus from the Federal Reserve and federal government continues to impact the economy.

### Climate Change...

• According to the International Panel on Climate Change (IPCC), greenhouse gas (GHG) emissions are warming global temperatures that may cause problems leading to catastrophic actions if we don't act quickly. As temperatures increase in most areas, ecosystems will be disrupted, which some argue will lead to food shortages and human health issues.

• Most articles on climate change assert that "the bulk of scientific research" support the conclusions. Yet, papers and articles continue to be published by recognized scientists and authors that question the conclusions of the IPCC. The task of measuring and then predicting cause and effect in a large and complex system such as the atmosphere of the earth is extremely difficult and can

easily lead to more variation than can be explained. Two important issues with data are the lack of sufficient history and lack of events similar to those being modeled.

• There is a paucity of information on the cost versus return of policies that can be pursued to reduce GHG emissions and even less information on how much of the costs will be passed on to consumers. McKinsey & Company has examined the cost-effectiveness of carbon reduction actions that provides policymakers with a rank-ordering of actions. Abatement policies such as commercial and electronic upgrades, for example, are those whose social benefits exceed the cost. These actions should be considered. However, the cost of abatement policies such as onshore wind and rooftop photovoltaic solar power do not offset their costs and therefore should not be construed as effective.

### In Virginia...

• Although the recession has gripped Virginia, the state is faring better than the nation. As of March 2009, employment in Virginia contracted by 98,000 jobs since reaching its peak in January 2008, a 2.6% drop compared with a decline of 3.7% in the nation. Over the twelve months ending March 2009, employment in the state fell 2.4% compared with 3.5% in the nation.

• Home sales continued to plummet in Virginia as they have in the nation. The Virginia Association of Realtors reported 81,808 homes sold in the state in 2008, a decline of 14% from 2007. The median sales price in 2008 was \$244,493, down 1.2% from the prior year. According to the Federal Housing Finance Agency's House Price Index, home prices fell 4.6% in Virginia in the fourth quarter of 2008 compared to a year earlier for the largest decline recorded since the index was begun in 1976.

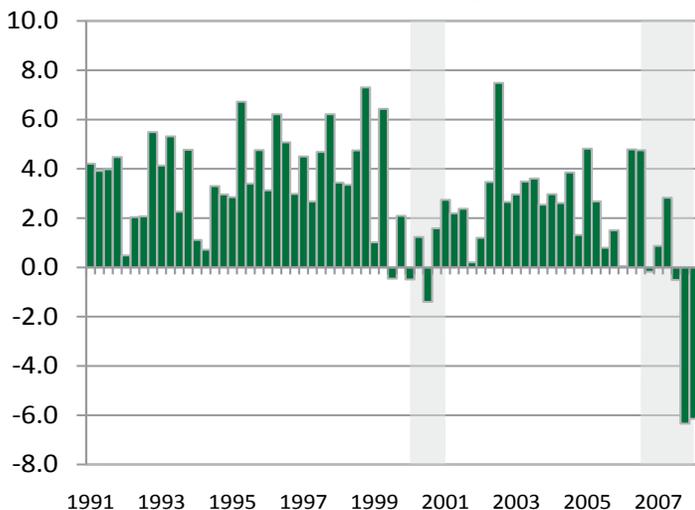
• Looking ahead, the economy is expected to contract further in 2009 before starting to grow in 2010. On an annual average basis, employment in the state is forecast to decline 1.6% in 2009 after showing no growth in 2008. Employment is expected to start to climb again in mid-2010, but the yearly comparisons are forecast to show a 0.7% drop in 2010. Residential building permits are forecast to drop 18.8% in 2009 after a 33.9% contraction in 2008; growth is expected to resume in 2010 with a 5.5% expansion.

## Recession, Not Depression

It is generally accepted that the national economy is in its worse shape since the Great Depression. Real gross domestic product (GDP) contracted at an annualized pace of about 6.0% during the last two quarters (Q4 2008 and Q1 2009). The unemployment rate rose to 8.9% for the first time in 25 years while businesses shed 5.5 million jobs since the recession began in December 2007. It's no wonder that the Conference Board's consumer confidence index slumped to 25.0 (Index 1985 = 100) in February 2009, down from 138.5 in March 2007 and the lowest since it began tracking consumers' expectations about economic growth in 1967.

Needless to say, with all this uncertainty, consumers and businesses have cut back spending. As a result, industrial production fell 12.8% over the year ending March 2009 for its fastest year-over-year decline since 1946. Similarly, capacity utilization dropped from 81.2% in August 2006 to 69.3% in March 2009—a level not seen since the index began in 1967.

### Real Gross Domestic Product Quarterly Annualized Percent Change



Source: Bureau of Labor Statistics

Even with all the bad news, the current downturn is not a depression. During the depression of the 1930s, the unemployment rate in the nation was greater than 20% for four years in a row. At one point it hit 25%. Real GDP also contracted for four consecutive years with declines of 8.6% in 1929, 6.4% in 1930, 13.0% in 1931, and 1.3% in 1932. Real GDP during the current recession has yet to show an annual contraction—it rose 1.1% in 2008 and we expect it to contract 3.1% in 2009 and then turn positive again in 2010.

Many economists define a depression as a 10% contraction in real GDP. By that measure, the current contraction is not expected to qualify as a depression when the final numbers are tallied.

The most recent prolonged recession that many readers may remember is the recession that started in the third quarter of 1981 and ended in the fourth quarter of 1982. Real GDP contracted 2.6% during that recession—the same amount that real GDP has contracted so far during the current recession. In terms of the unemployment rate, it reached 10.8% at the close of the 1982 recession while it stood at 8.9% as of April 2009.

## A Housing/Finance-Led Recession

This recession has been distinct from many in the past because of its origination in the housing market and the dramatic spillover to the financial industry. An understanding of the events leading up to the recession help explain why the recession unfolded as it did. The double-digit home price increases that accompanied the national housing market boom from around 2000 through 2006<sup>1</sup> laid the foundation for a bubble that eventually burst and spilled over into the broader economy. A proliferation of highly creative mortgages resulted from a confluence of the following events: a desire for more individuals to own their own home, investors seeking higher-yielding instruments, and the misguided perception that banks were adequately managing their risk because they owned collateralized bond obligations (CBOs)<sup>2</sup> along with insurance to cover severe events.

When housing market prices began to slow and then decline in some regions around the county, foreclosures increased as many mortgages exceeded home values. In California, for example, the average home price tracked by the Office of Federal Housing Enterprise Oversight fell 20.5% over the year ending with the fourth quarter of 2008.

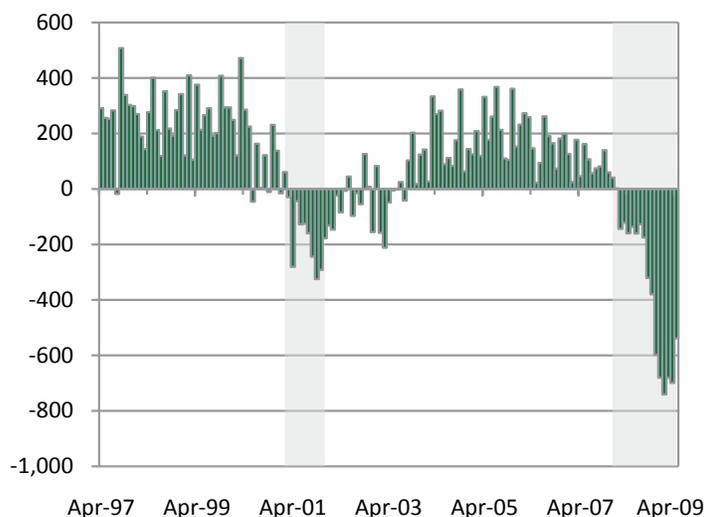
<sup>1</sup>The exact dates of the home price increases and subsequent declines vary by geographic region.

<sup>2</sup>Mortgage-backed securities were included in some collateralized bond obligations.

From that perspective, an average California house bought in late 2007 for \$600,000 was only worth \$477,000 by the end of 2008, which carries a strong incentive to foreclose, particularly if the purchase occurred without any down payment.

As foreclosures increased to a level more severe than investors and insurers had anticipated, some CBOs started losing value. The rapid loss of liquidity in the financial industry led the Federal Reserve to inject capital into the banking system through the Term Auction Facility (TAF). (See the *Thomas Jefferson Institute for Public Policy Virginia Economic Update 2008-09* published June 2008 for a more thorough discussion of the factors that drove the housing boom and bust.) The security losses eventually led to the collapse of Lehman Brothers in September 2008. At that point, uncertainty and concerns about the banking system and its impact on the economy rose to such high levels that consumers and businesses cut back spending significantly. As shown in the employment chart, U.S. employment shed an average 192,000 jobs from February to October 2008 and increased to an average 656,000 loss through April 2009.

### Employment Growth Monthly Change in Thousands



Source: Bureau of Labor Statistics

## Monetary and Fiscal Policy

The severity of the national financial crisis prompted stimulus from both the Federal Reserve Board (Fed) and the federal government. Fed monetary policy is “to promote effectively the goals of maximum employment, stable prices, and

moderate long-term interest rates,”<sup>3</sup> and its duties include “maintaining the stability of the financial system and containing systemic risk that may arise in financial markets.” Consequently, the Fed reacted quickly and creatively to the crisis. With the federal funds rate lowered to virtually 0% in December 2008, the Fed began purchasing agency securities, mortgage-backed securities, and other investments in order to relax the credit crunch and lower interest rates on loans for consumers and businesses. As a result of these actions, for example, the 30-year conventional mortgage rate has been below 5.0% since mid-March 2009.

Although fiscal policy generally takes longer to formulate and implement than Fed policy, two stimulus plans have been passed since the fall of 2008. The Emergency Stabilization Act of 2008 was enacted on October 3 under the Bush administration. Among other things, it allowed the U.S. Treasury to provide financial institutions with liquidity through the Troubled Asset Relief Program (TARP).<sup>4</sup> It was followed by a \$787 billion stimulus bill signed into law by President Obama in February 2009 that is providing both federal spending and tax cuts in an effort to jump-start economic growth.

## Signs of Hope

Signs of hope started to emerge late in 2008 that the banking industry was beginning to recover and the economy was following suit. The TED<sup>5</sup> spread (3-month LIBOR minus the 3-month T-bill),<sup>6</sup> which is an indicator of confidence between banks,<sup>7</sup> spiked to more than 550 basis points (bps) when the subprime mortgage crisis began to unravel. In other words, a loss of confidence between banks means that they no longer have the liquidity of borrowing from each other and when they do borrow, it occurs at a high interest rate. It has since fallen to about 120 bps. Although that is still high by historical standards, the lower spread reflects some improvement in the banking industry. By comparison, the TED spread was hovering around 30 bps during the first half of 2007.

<sup>3</sup>Board of Governors of the Federal Reserve System, *The Federal Reserve System Purposes & Functions*, June 2005, page 1.

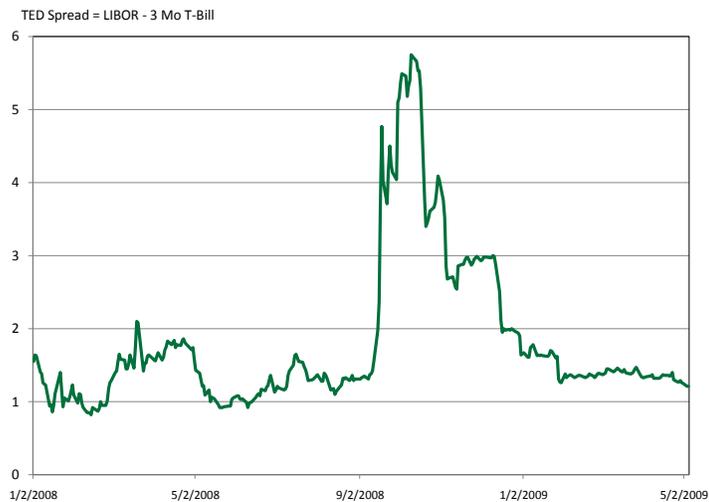
<sup>4</sup>TARP allows the U.S. Treasury to purchase or insure up to \$700 billion of “troubled” assets in U.S. financial institutions.

<sup>5</sup>TED is an acronym based on T-Bill and ED, the ticker symbol for the Eurodollar futures contract.

<sup>6</sup>LIBOR, the London Inter Bank Offered Rate, is the rate that banks use to loan to each other while the 3-month bill is from the U.S. Treasury which is assumed to carry no risk.

<sup>7</sup>During strong economic times the TED spread hovers around 10 and 20 basis points.

## The Declining TED Spread Points to Improvement in the Banking Industry



Source: Federal Reserve Board

Signs that the economy is nearing the bottom in this recession are becoming apparent. The stock market, which generally begins to increase before the economy comes out of recession, has been growing since early March 2009. In addition, businesses continue to lay off workers, but the number of layoffs has slowed as is typical when a recession is winding down. Consumers have also become a little more optimistic about future economic growth based on the Conference Board's consumer confidence index. Nevertheless, that confidence has not yet turned into a sustained increase in retail spending.

## Forecast

The Chmura Economics & Analytics forecast expects real GDP to contract 3.1% in 2009 before growing 1.1% in 2010. The recovery is expected to take hold in the first quarter of 2010 as (1) the banking industry continues to improve, (2) the inventory overhang of houses, retail, and manufactured goods is reduced, and (3) the stimulus from the Federal Reserve and federal government continues to impact the economy.

While consumers contributed to economic growth in the first quarter of 2009, they are expected to retrench again in the second quarter as unemployment continues to rise. Their contribution to economic growth is expected to be negative in 2009 before rebounding in 2010. Contractions in residential and nonresidential investment are expected to weigh heavily on the economy in 2009 with housing activity

finally picking up in the first quarter of 2010. Nonresidential investment, however, will continue to contract at a modest pace in the first quarter of 2010 before starting to grow in the second quarter. In contrast, government expenditures are expected to grow over the entire forecast horizon.

With the drop-off in demand, the consumer price index will likely contract through the end of this year. The short period of deflation is not expected to persist, however, as prices are forecast to rise in the first quarter of 2010.

Interest rates are forecast to remain low over the next year as the Fed continues to add liquidity to the financial markets. In fact, we expect the Fed to hold the federal funds rate target at essentially zero through all of 2009 and at least through the first half of 2010 while banks are rebuilding their balance sheets.

## National Forecast Summary

	Actual		Forecast		
	2007	2008	2009	2010	2011
<b>Percent Change</b>					
Real Gross Domestic Product	2.1	1.1	-3.1	1.1	2.7
Consumption Expenditures	2.8	0.2	-0.6	1.4	1.9
Gross Private Domestic Investment	-5.4	-6.9	-24.7	-0.6	9.5
Residential	-18.0	-20.8	-24.0	-1.7	12.9
Nonresidential	4.9	1.6	-21.8	-4.3	6.7
Government Expenditures	2.1	2.9	1.9	2.9	2.1
<b>Trade Deficit (Billions of 2000 Dollars)</b>					
Net Exports, Goods & Services	-547.3	-391.1	-315.0	-342.5	-366.6
<b>Percent Change</b>					
Consumer Price Index	2.9	3.8	-0.3	1.2	2.9
<b>Yields (%)</b>					
Federal Funds Rate	5.0	1.9	0.2	0.5	1.8
Prime Rate	8.1	5.1	3.3	3.6	4.7
10-Year Treasury	4.6	3.7	3.0	3.3	3.8
30-Year Conventional Mortgage	6.3	6.0	4.9	4.9	5.6

Source: Chmura Economics & Analytics  
Note: Yields reported for the average of the year.

## Climate Change

Federal policy in this area could impact future economic growth. For that reason, this year's *Economic Forecast* outlines this debate and economic factors to be considered in policy decisions.

## What Do We Know?

According to the International Panel on Climate Change (IPCC), greenhouse gas (GHG) emissions are warming global temperatures that may cause problems leading to catastrophic actions if we don't act quickly. IPCC climate

models predict that global mean warming will increase 1.8°C to 4.0°C by the end of the century (2090 – 2099).<sup>8</sup> The higher temperatures will lead to higher sea levels. According to the Chesapeake Bay Program’s Scientific and Technical Advisory Committee, the sea levels of the Chesapeake Bay will rise 2.3 to 5.2 feet by 2100 because of climate change.<sup>9</sup> The higher sea levels will cause issues for some bridges and other infrastructure around the nation. Moreover, storm surges from hurricanes will be more devastating than in the past. Insurance prices will likely increase for areas expected to be affected.

As temperatures increase in most areas,<sup>10</sup> ecosystems will be disrupted. The extinction of one species may ripple through the food chain with potentially far-reaching implications. The agriculture, forestry, and fishing industries are expected to be adversely affected, for example.

Human health can also be impacted. Some argue that food shortages will be induced that lead to increased starvation. Heat-related deaths will likely rise, and climate change may lead to an increase in extreme weather events which in turn may compromise water and food supplies. Climate change can lead to the alteration of natural systems making it possible for certain diseases to spread or emerge in areas where they previously had been limited or non-existent.<sup>11</sup>

The findings of the IPCC were popularized three years ago by former Vice-President Al Gore’s movie, “An Inconvenient Truth.” Recently, the Environmental Protection Agency’s (EPA) declaration that carbon dioxide (CO<sub>2</sub>) and five other industrial emissions threaten the planet<sup>12</sup> laid the foundation for federal regulations to cap emissions at a potential cost of billions of dollars to businesses and government.<sup>13</sup>

According to the IPCC, we must act quickly since past emissions have already assured some degree of future warming. The longer we wait, the greater the potential damage. According to the Netherlands Environment Assessment Agency, China’s CO<sub>2</sub> emissions from fossil fuel use and industrial processes has exceeded that of the United States since 2006 with increased emissions expected to continue. Just one year earlier, emissions of CO<sub>2</sub> in China were 2% below that of the United States.

<sup>8</sup>IPCC. 2007a. “Summary for Policymakers” in *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Ed. Martin Parry, Osvaldo Canziani, Jean Palutikof, Paul van der Linden, and Clair Hanson; and IPCC. 2007b. *Climate Change 2007: The Physical Science Basis*. Ed. Bert Metz, Ogunlade Davidson, Peter Bosch, Rutu Dave, and Leo Meyer.

<sup>9</sup>Governor’s Commission on Climate Change, page 2. However, the relative sea level in the Bay is rising at twice the average globally due to wetland loss. See: <http://ftp.ngs.noaa.gov/GRD/GPS/Projects/CB/cb.html> last viewed May 17, 2009.

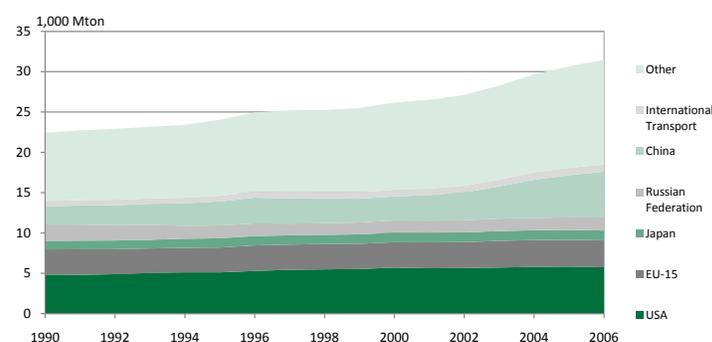
<sup>10</sup>IPCC climate models show that some regions around the globe will become cooler due to the weather pattern changes brought about by GHG emissions.

<sup>11</sup>Governor’s Commission on Climate Change, page 3.

<sup>12</sup>According to the IPCC, the greater the concentration of GHGs in the atmosphere, the more heat is trapped, which leads to higher temperatures.

<sup>13</sup>“U.S. in Historic Shift on CO<sub>2</sub>,” *Wall Street Journal*, April 18-19 2001, page A1, column 1.

## Global CO<sub>2</sub> Emissions from Fossil Fuel Use by Region



Source: IEA 2006; BP 2007

## How Certain Is it?

Most articles on climate change assert that “the bulk of scientific research” support the conclusions. Yet, papers and articles continue to be published by recognized scientists and authors like Robert Carter,<sup>14</sup> William Cotton,<sup>15</sup> Douglas Hoyt,<sup>16</sup> Richard Lindzen,<sup>17</sup> Roger Pielke Sr.,<sup>18</sup> Willie Soon,<sup>19</sup> and Roy Spencer<sup>20</sup> that question the conclusions of the IPCC. Besides questions of methodology, even the data are under scrutiny. For example, John Christy, Alabama State Climatologist and Distinguished Professor of Atmospheric Science at the University of Alabama, questions historical temperature estimates used by the IPCC as overestimating actual temperatures.<sup>21</sup>

The task of measuring and then predicting cause and effect in a large and complex system such as the atmosphere of the earth is extremely difficult and can easily lead to more variation than can be explained. Accurate forecasts require an understanding of the relationships among the variables in the model, good assumptions, and historical data that cover a sufficient time and include episodes that are similar to those being forecast.

<sup>14</sup>Carter is an adjunct Research Professor at James Cook University (Queensland) and the University of Adelaide (South Australia).

<sup>15</sup>Cotton is a Professor in the Department of Atmospheric Science at the Colorado State University.

<sup>16</sup>Hoyt is a solar physicist and climatologist who worked for more than thirty years as a research scientist in the field.

<sup>17</sup>Lindzen is an atmospheric physicist and Alfred P. Sloan Professor of Meteorology at the Massachusetts Institute of Technology.

<sup>18</sup>Pielke is currently a Senior Research Scientist in CIRES and a Senior Research Associate at the University of Colorado-Boulder.

<sup>19</sup>Soon is an astrophysicist and a geoscientist at the Solar, Stellar, and Planetary Sciences Division of the Harvard-Smithsonian Center for Astrophysics.

<sup>20</sup>Spencer is a Principal Research Scientist at the University of Alabama, Huntsville.

<sup>21</sup>See, Christy, J.R., W.B. Norris, K. Redmond and K. Gallo, 2006; Methodology and results of calculating central California surface temperature trends: Evidence of human-induced climate change? *J. Climate*, 19, 548-563; and Christy, J.R. and R. W. Spencer, 2005: Correcting temperature data sets. *Science*, 310, 972.

An accurate forecasting model must first identify the variables that drive the changes in climate and then define the relationships among them. There are many variables affecting the global system and the relationship among those variables is poorly understood. A rigorous model should show not only the correlation between global warming and greenhouse gases, but also the causality between the two. Furthermore, identifying which variables to include is not straightforward. Even though a model matches historical data well, that is not a guarantee of success in the future because variables not previously accounted for may unexpectedly come into play. The current recession, for example, was not well foreseen because it arose from variables not adequately accounted for in conventional forecasting models.

All forecasts are driven by assumptions. In the case of climate change, scientists are assuming a particular pace of GHG emissions, among other things. The pace of GHG emissions are influenced, however, by a myriad of factors such as population and economic growth, technological changes, government regulations, and market-driven factors. Changes in these areas can impact future GHG emissions in ways not accounted for in current assumptions.

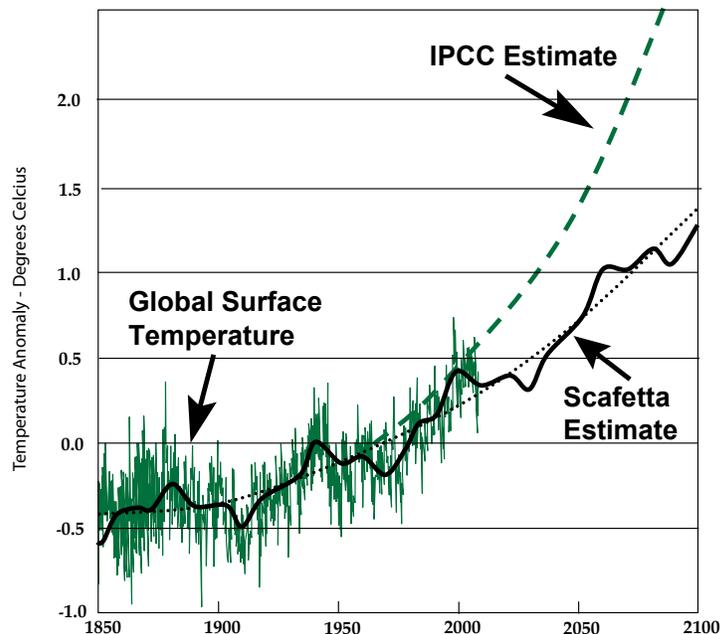
Two important issues with data are the lack of sufficient history and lack of events similar to those being modeled. First, data on the history of the temperature of the planet are limited and not very reliable beyond the last 50 years. Data on the concentration of GHG in the atmosphere face similar issues. Second, forecasting an event that has not occurred in the history of the data is problematic. Most forecasters, for example, would not put much confidence in a forecast where global temperature rises from 1.8°C to 4.0°C over a 90-year period if the historical data used in the model showed a much smaller temperature change.<sup>22</sup>

Nicola Scafetta, a research associate at Duke University, devised a model where the influence of solar activity on global temperature is found to be larger than previously thought. While his model forecasts an increasing trend in global temperature, the rate of increase is more subdued than that projected by the IPCC. Scafetta estimates that as of 2100, global temperatures will rise by about 1.4° C as shown in the figure below.<sup>23</sup> The dashed line on the graph is the IPCC temperature projection.

<sup>22</sup>If an event is modeled that has not occurred in history, then variable relationships must be devised based on subjective reasoning rather than observed events. For example, suppose temperature and GHG has a logistic relationship. That means temperatures will rise faster when GHG levels are low, but stabilize when GHG levels are high. A model without high levels of GHG in the past will not be able to reveal the relationship and will erroneously predict a higher temperature with high GHG levels.

<sup>23</sup>Scafetta, N., 2009, "Climate Change and Its Causes: A Discussion about Some Key Issues". See: [http://yosemite1.epa.gov/ee/epa/wkshp.nsf/84E74F1E59E2D3FE852574F100669688/\\$file/scafetta-epa-2009.pdf](http://yosemite1.epa.gov/ee/epa/wkshp.nsf/84E74F1E59E2D3FE852574F100669688/$file/scafetta-epa-2009.pdf)

## Global Temperature Forecasts Scafetta Projection versus IPCC Estimate



## What Are the Policy Implications?

Unfortunately, policymakers remain faced with the difficult task of wading through highly uncertain forecasts to strike a balance that protects the planet based on facts rather than panic-driven actions as they consider the economic consequences.

There is a paucity of information on the cost versus return of policies that can be pursued to reduce GHG emissions and even less information on how much of the costs will be passed on to consumers.<sup>24</sup> The Wall Street Journal reported that American Electric Power (AEP) is already considering which coal plants it would have to close down and how rates would be affected in light of the climate change strategies that are being debated in Washington. "AEP spokesman Pat Hemlepp said rate increases stretch from 25% to 50% and beyond..."<sup>25</sup>

Although a detailed cost-benefit analysis is not available at this time, McKinsey & Company has examined the cost-effectiveness of carbon reduction actions.<sup>26</sup> The table here uses its study to provide policymakers with a rank-ordering of actions. Abatement policies such as commercial and electronic upgrades are those whose social benefits exceed the cost. These actions should be considered. However, the cost of abatement policies such as onshore wind and rooftop photovoltaic solar power do not offset their costs and therefore should not be construed as effective.

<sup>24</sup>The following book provides a view of the potential economic costs of policy changes related to climate change: William Nordhaus, 2008, *A Question of Balance: Weighing the Options on Global Warming Policies*, Yale University Press.

<sup>25</sup>"U.S. in Historic Shift on CO<sub>2</sub>," *Wall Street Journal*, April 18-19 2001, page A4, column 2.

<sup>26</sup>McKinsey & Company. December 2007. "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" The Conference Board.

## Cost Effectiveness of Carbon-Reduction Actions

Action	\$/Ton CO2
<b>THE FOLLOWING ACTIONS PAY FOR THEMSELVES</b>	
Commercial electronics upgrades	- \$92
Residential electronics upgrades	- \$92
Residential building lighting upgrades	-\$91
Commercial buildings – LED lighting	- \$90
Fuel economy packages – cars	- \$85
Commercial buildings – CFL lighting	- \$80
New residential buildings – shell imp.	- \$70
Fuel economy packages – Light trucks	- \$65
New commercial buildings – shell imp.	- \$55
Commercial bldgs – comb. heat & pwr	- \$40
Cellulosic biofuels	- \$15
Industrial process improvements	- \$15
Industrial heat & power	- \$12
Existing power plant conversion imp	- \$12
Residential water heaters	- \$10
Conservation tillage	- \$10
Coal mining – methane management	- \$5
Commercial buildings – control system	- \$5
<b>THE FOLLOWING ACTIONS DO NOT PAY FOR THEMSELVES BUT THEIR SOCIAL BENEFITS OUTWEIGH THEIR COST</b>	
Manufacturing – HCF management	\$2
Residential building – shell retrofits	\$10
New Nuclear plant	\$10
Onshore wind – low penetration	\$10
<b>THE FOLLOWING ACTIONS DO NOT PAY FOR THEMSELVES AND THEIR COST OUTWEIGHS THEIR SOCIAL BENEFIT</b>	
Natural gas and petrol systems mgmnt	\$15
Active forest management	\$18
Afforestation of pasture land	\$18
Reforestation	\$25
Winter crops	\$27
Onshore wind – medium penetration	\$27
Rooftop photovoltaic solar power	\$29
Power plant w/ new clean coal & EOR	\$30
Biomass co-firing power	\$30
Coal power plant rebuild CCS & EOR	\$38
Onshore wind – high penetration	\$40
Afforestation of cropland	\$45
Commercial bldg - upgraded HVAC	\$45
Power plant w/ new clean coal	\$45
Concentrating solar power	\$48
Industrial new CCS builds	\$50
Residential – upgraded HVAC	\$50
Power plant w/ CCS rebuilds	\$50
Coal to Gas fuel change	\$60
Hybrid automobiles	\$90

Source: Center for Environmental Stewardship, Thomas Jefferson Institute for Public Policy. *Which Carbon Emission Reduction Activities Make Sense*, September 6, 2008, Table 1, presenting data abstracted from: McKinsey & Company, *Reducing U.S. greenhouse gas emissions: How much at what cost?*, Executive Summary Exhibit B, p. xiii, November 2007, available at: [http://www.mckinsey.com/client-service/ccsi/pdf/US\\_ghg\\_final\\_report.pdf](http://www.mckinsey.com/client-service/ccsi/pdf/US_ghg_final_report.pdf) (last visited May 3, 2009).

We all need to be good stewards of the global ecosystem. Government regulation of behavior is one way to protect the environment, but market-driven approaches are often more efficient while regulation sometimes creates unexpected secondary effects. For example, government regulations to increase the percentage of ethanol in gasoline led to inflation in basic food prices that ultimately had a disproportionately negative impact on low-income workers; conversely, scientists cannot agree on the benefits to carbon reductions from ethanol-diluted gasoline given that ethanol is also carbon-based. On the other hand, when gasoline

prices surged above \$4.00 a gallon last year, hybrid sales took off and consumers started car-pooling, taking public transportation, and even riding bicycles. It is interesting to note that these actions were taken without regulation.

Today's consumer-driven market is creating its own regulatory system for GHG emissions. Although a practice clearly in its infancy, some companies have begun to measure their "carbon footprint," the amount of emissions that a company has committed to neutralize. Although there is no standard definition of what makes up a footprint, companies might include employee business travel and electricity usage at offices and encourage more virtual meetings and even telecommuting. If new policies can't take the company to a "carbon neutral status," then they voluntarily buy renewable-energy certificates that basically invest in green technology or research that, in theory, would not be possible without such subsidies. Nearly 10.6 million of these certificates were bought by U.S. firms in 2007 compared to 660,000 in 2003 according to the U.S. National Renewable Energy Laboratory.<sup>27</sup>

Further complicating the creation of emission-reductions policies is the modest impact that certain proposed solutions can have. For example, under the Waxman-Markey Bill, CO2 emissions from the United States in the year 2050 are proposed to be 83% less than they were in 2005. According to former Virginia State Meteorologist and Professor of Meteorology at Virginia Tech, Patrick J. Michaels, "an 85% reduction would amount to a reduction of global warming of less than three-thousandths of a °C per year."<sup>28</sup> While sustained action and global cooperation would have a larger impact, emission reductions among developed countries will run counter to the virtually inevitable increases among currently undeveloped nations.

The state of Virginia, with its long coast line, may see a higher-than-average impact from global warming if the IPCC and other scientists are accurate in the ninety-year forecasts. The great amount of uncertainty involved in the outcomes, however, calls for measurements to apply the most effective policies with the least cost to all citizens, especially those with low income. It also calls for more research to ascertain the complex relationship between global warming and GHG emissions, research into the secondary consequences of climate-control policies, and the exploration of alternative solutions.<sup>29</sup>

<sup>27</sup>This paragraph draws from the Wall Street Journal: "Green Goal of 'Carbon Neutrality' Hits Limit," December 30, 2008, pages A1, col. 6 and A8, cols. 1-6.

<sup>28</sup>Michaels, P, 2009, "What You Can't Do About Global Warming", World Climate Report. See: <http://www.worldclimaterreport.com/index.php/2009/04/30/what-you-cant-do-about-global-warming/>

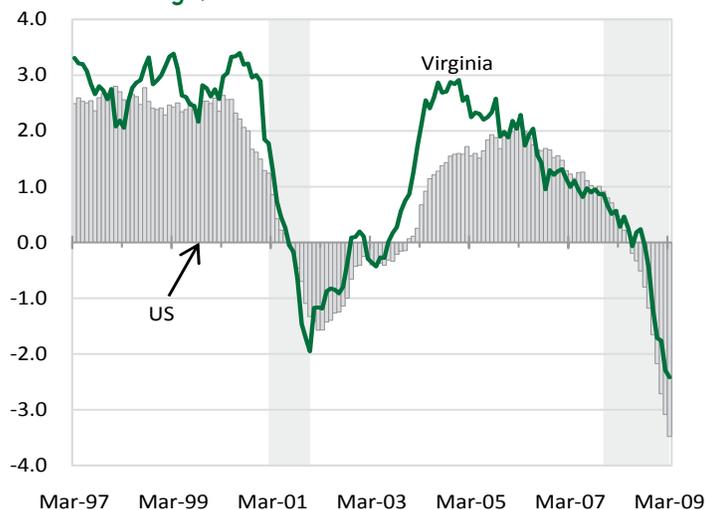
<sup>29</sup>Alternative solutions include, for example, geoengineering, large-scale deliberate modifications to the earth's environment to promote habitability, such as described here: <http://www.scrippsnews.com/node/31660>.

Although the recession has gripped Virginia, the state is faring better than the nation. As of March 2009, employment in Virginia contracted by 98,000 jobs since reaching its peak in January 2008, a 2.6% drop compared with a decline of 3.7% in the nation. Over the twelve months ending with March 2009, employment in the state fell 2.4% compared with 3.5% in the nation.

However, not all the metropolitan statistical areas (MSA) in the state are performing better than the nation. Employment in Winchester has fallen 8.3% from its peak. Employment in Blacksburg (-5.7%), Harrisonburg (-4.6%), and Richmond (-4.0%) contracted more than the nation. In contrast, Northern Virginia has seen the least contraction with a 1.6% drop in employment from its peak, closely followed by Lynchburg with a 1.9% decline.

Looking ahead, the economy is expected to contract further in 2009 before starting to grow in 2010. On an annual average basis, employment in the state is forecast to decline 1.6% in 2009 after showing no growth<sup>30</sup> in 2008. Employment is expected to start to climb again in mid-2010, but the yearly comparisons are forecast to show a 0.7% drop in 2010. Residential building permits are forecast to drop 18.8% in 2009 after a 33.9% contraction in 2008; growth is expected to resume in 2010 with a 5.5% expansion.

### Employment Growth Percent Change, Year-Over-Year



Source: Bureau of Labor Statistics

## Recent Growth

The current recession is turning out to be worse than the previous two in most regions around the state. As of March 2009, auto registrations and building permits have fallen more from peak to trough in each of the eleven metro areas when compared with the previous two recessions.

As of March 2009,<sup>31</sup> employment in seven of the eleven metro areas decreased by a larger percentage in the current recession compared with at least one of the last two recessions. The exceptions are Danville, Lynchburg, Roanoke, and Northern Virginia. The drop in employment in Danville is approaching the percentage decline that occurred in the last two recessions when the textile and apparel industries were much larger. Both Lynchburg and Roanoke are benefitting from expansions that are offsetting recession-related losses. In Lynchburg, the renewed interest in nuclear energy is creating job growth at AREVA<sup>32</sup> while Roanoke is benefitting from the expansion at Carillion Roanoke Memorial Hospital. In Northern Virginia, employment declined only 1.6% through March 2009 from its peak in July 2008; but during the 1990 recession, which was partially driven by commercial office overbuilding and defense downsizing, Northern Virginia lost 4.4% of its jobs.

As shown in the Virginia recession comparisons table (next page), the drop in auto registrations and residential building permits are larger than in the last two recessions. With the current recession expected to last another nine months, retail sales will undoubtedly surpass the decline that occurred in 1990 and employment losses are likely to surpass those of 1990.

Over the twelve months ending March 2009, employment declined at a slightly slower pace in Virginia than in the nation. Employment contracted 2.4% (-91,168 jobs) in the state over this period compared to a 3.5% decline in the nation, ranking Virginia 20th among the fifty states for this twelve-month period.

Virginia lost jobs in all but two major sectors over the year ending March 2009, losing jobs in the same sectors contracting in the nation over the same period. Virginia's construction sector shed the largest number of jobs over the

<sup>30</sup>Even though employment peaked in January 2008 and declined over the calendar year, the annual average rate of growth (AAR) was 0.0%. AAR for 2008 is computed by comparing average employment in 2008 to average employment in 2007, and by this comparison there was virtually no change.

<sup>31</sup>Metro area employment data for this comparison were as of March 2009 except Danville data which were as of September 2008.

<sup>32</sup>AREVA NP, an international firm with U.S. headquarters in Lynchburg, performs work in design and construction of nuclear power plants and research reactors. In 2008, the company announced a \$25 million, 500-job expansion in Lynchburg.

## Virginia Recessions Comparison

	1990 Recession			2001 Recession			Current Recession*		
	% Change	Peak Date	Trough Date	% Change	Peak Date	Trough Date	% Change	Peak Date	Trough Date**
<b>Employment</b>	-3.2%	Mar-90	Jul-91	-2.2%	Dec-00	Apr-03	-2.6%	Jan-08	Mar-09
<b>Auto Registrations</b>	-33.9%	Jul-88	Apr-91	-15.1%	May-00	Mar-03	-46.2%	Mar-04	Mar-09
<b>Retail Sales</b>	-7.1%	May-90	Apr-91	-2.3%	Jan-01	Nov-01	-7.1%	Oct-07	Mar-09
<b>Building Permits</b>	-53.9%	Jan-89	Mar-91	-11.5%	May-99	Jan-00	-71.7%	Dec-04	Mar-09
<b>Initial Claims</b>	Data not available			95.2%	May-00	Apr-03	112.1%	Apr-06	Mar-09

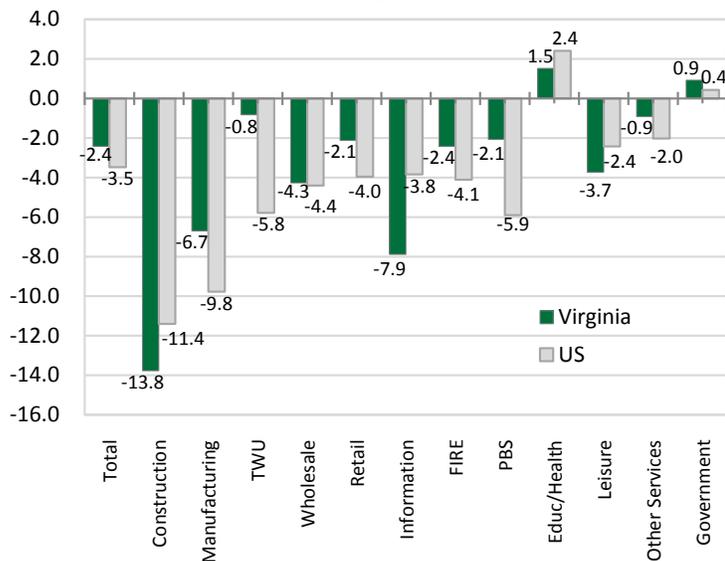
Note: Due to the volatility of the data, the peak and trough points represent a six-month moving average for all data except nonfarm employment, which represents one month of data. Employment data go back to Jan-90, auto to Jun-88, retail to Jun-87, permits to Jun-88, and claims to Jun-92. "Peak" and "trough" for initial claims represent the low and high points respectively.

\*The current recession began in December 2007.

\*\* Through most recent data available

last year (-31,543 jobs) as the housing downturn continues to plague the economy. This sector has posted monthly declines since September 2007. The manufacturing sector declined 17,887 jobs in the state over the last twelve months for the second largest drop over the period. Although the decline in manufacturing has accelerated during the recession, it has declined by 119,000 jobs (a loss of 32% of employment) over the ten years from March 1999 to March 2009. The slow housing market and stress in the banking industry has also taken a toll on financial employment<sup>33</sup> with the finance, insurance, and real estate sector (FIRE) shedding 4,603 jobs over the year ending March 2009.

### Employment Growth by Sector Percent Change, Year Ending March 2009



Note: TWU = Transportation, warehousing, and utilities  
FIRE = Finance, insurance, and real estate  
PBS = Professional and business services

Similar to the nation, the only two sectors to add employment in the state over the last year were the education and health services sector and the government sector.<sup>34</sup> Education and health services added 6,575 jobs over the year ending March 2009, the largest gain among Virginia's sectors. Higher education often sees increased enrollment during recessions because some students who can't find jobs continue their education. Health services are generally insensitive to business cycles and continue to benefit from an aging population. In addition, the government sector added 6,426 jobs in Virginia over the year ending March 2009, with jobs being added at the federal (+5,431 jobs) and state level (+2,998 jobs) while local government employment declined (-2,003 jobs).

For the year ending March 2009, only two state MSAs added jobs. Blacksburg had the most growth (+1.5%, +1,066 jobs) followed by Lynchburg (+0.3%, +278 jobs). Because Blacksburg is small, its employment tends to be volatile and the latest increase is not expected to persist. The modest growth in Lynchburg is expected to slow due to overall pressure from the national recession. In contrast, the fastest pace of decline occurred in Winchester (-4.6%, -2,605) followed by Bristol (-3.5%, -4,309 jobs) and Richmond (-3.5%, -21,804). The largest number of jobs lost was in Richmond (-21,804) followed by Northern Virginia (-15,895).

<sup>33</sup>For example, firms that provide consumer lending, real estate credit, international trade financing, and secondary market financing that are collectively classified as "nondeposit credit intermediation" shed 4,475 jobs (-15.0%) from the third quarter of 2007 to the third quarter of 2008 (the latest data available at this level of detail).

<sup>34</sup>The high-technology sector is not included in this statement because (1) it is not part of the same classification system (North American Industry Classification System) but is made up of components from several of these sectors and (2) the most recent data for high tech is of a different time period.

## Technology

Employment in the high-tech industry in Virginia continued to grow on a year-over-year basis in the third quarter of 2008 (the latest data available) while overall employment declined. For the year ending with the third quarter of 2008, the high-tech industry expanded 2.8% (+15,971 jobs) compared to a 0.2% decline for all industries. High-tech industries also provide higher average annual wages compared to all industries. Average annual wages in Virginia's high-tech industries were \$88,027 as of the third quarter of 2008 compared to \$46,908 in all industries. High-tech wages and salaries typically grow at a faster pace than that for all industries. However, that was not the case for the year ending with the third quarter of 2008

when high-tech wages and salaries grew 2.3% compared to 2.8% for all industries.

Level one high-tech industries are those employing a higher percentage of technology-oriented occupations compared with level two or level three industries. Among level one industries in Virginia, the largest job gains over the year ending with the third quarter of 2008 were posted in computer systems design and related services (+7,864 jobs) and architectural, engineering, and related services (+1,871). Over the same period, job losses included 876 in computer and peripheral equipment manufacturing and 494 in semiconductor and other electronic component manufacturing. Four other level one high-tech industries shed jobs over the last year.

### High-Technology Growth in Virginia

NAICS Industry	Employment				Wages and Salaries Thousands of Dollars*			
	2007Q3	2008Q3	Change	% Change	2007Q3	2008Q3	Change	% Change
<b>Total Employment</b>	<b>3,663,654</b>	<b>3,657,733</b>	<b>-5,921</b>	<b>-0.2</b>	<b>40,894,937</b>	<b>41,782,833</b>	<b>887,896</b>	<b>2.2</b>
<b>Total High Technology</b>	<b>577,120</b>	<b>593,091</b>	<b>15,971</b>	<b>2.8</b>	<b>11,957,263</b>	<b>12,482,752</b>	<b>525,489</b>	<b>4.4</b>
<b>Level 1</b>	<b>268,827</b>	<b>278,562</b>	<b>9,735</b>	<b>3.6</b>	<b>5,582,050</b>	<b>5,996,744</b>	<b>414,694</b>	<b>7.4</b>
3254 Pharmaceutical and Medicine Manufacturing	3,618	3,613	-6	-0.2	61,223	64,672	3,449	5.6
3341 Computer and Peripheral Equipment Manufacturing	1,667	791	-876	-52.5	20,439	11,212	-9,227	-45.1
3342 Communications Equipment Manufacturing	2,978	3,119	141	4.7	62,010	71,665	9,654	15.6
3344 Semiconductor and Other Electronic Component Manufacturing	7,063	6,568	-494	-7.0	107,680	104,896	-2,784	-2.6
3345 Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	5,239	5,152	-87	-1.7	105,718	106,870	1,152	1.1
3364 Aerospace Product and Parts Manufacturing	1,444	1,408	-37	-2.5	21,470	23,116	1,647	7.7
5112 Software Publishers	5,268	5,197	-72	-1.4	147,506	146,490	-1,016	-0.7
5182 Data Processing, Hosting, and Related Services	12,199	12,662	463	3.8	211,104	234,045	22,941	10.9
5191 Other Information Services	8,024	8,545	521	6.5	85,308	103,347	18,039	21.1
5413 Architectural, Engineering, and Related Services	68,718	70,590	1,871	2.7	1,327,842	1,371,358	43,516	3.3
5415 Computer Systems Design and Related Services	127,152	135,016	7,864	6.2	2,868,673	3,169,202	300,530	10.5
5417 Scientific Research and Development Services	25,456	25,901	446	1.8	563,079	589,872	26,793	4.8
<b>Level 2</b>	<b>162,538</b>	<b>168,636</b>	<b>6,097</b>	<b>3.8</b>	<b>3,668,698</b>	<b>3,749,119</b>	<b>80,421</b>	<b>2.2</b>
<b>Level 3</b>	<b>145,754</b>	<b>145,893</b>	<b>139</b>	<b>0.1</b>	<b>2,706,515</b>	<b>2,736,889</b>	<b>30,374</b>	<b>1.1</b>

\* Includes some stock options that were exercised.

Note: Data in this table include both privately-owned and government-owned high-tech operations. Figures may not sum to totals due to rounding. Industries for which data are not disclosed are excluded from the table but not from the total high-tech figures.

Source: Chmura Economics & Analytics and Virginia Employment Commission

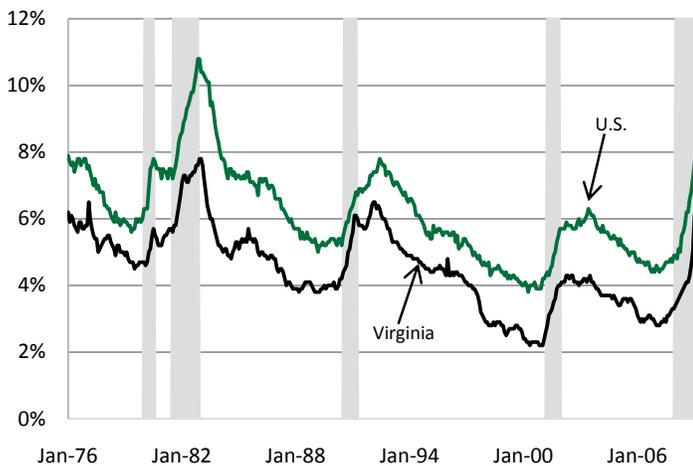
*An industry is defined as high-tech in this publication if, at the national level, it possesses at least double the percentage of employment in technology-oriented occupations compared to the average for all industries. Level one high-tech industries possess at least five times the average of technology-oriented occupations, level two employ 3.0 to 4.9 times the average, and level three at least 2.0 times the average.*

The Northern Virginia metropolitan area accounts for the majority of high-tech industry jobs in the state. Northern Virginia provides over half of all high-tech industry employment in Virginia and nearly two-thirds of level one employment. This dominance continued over the twelve months ending with the third quarter of 2008 as Northern Virginia added 7,357 high-tech jobs including 4,043 in computer systems design and related services.

## Labor Market

Similar to the nation, the unemployment rate in Virginia has been rising since early in 2007. The state unemployment rate has risen rapidly since October 2008 and hit 6.8% in March 2009 compared with 8.5% in the nation. The current unemployment rate in Virginia is the highest since April 1983. The unemployment rate typically continues to rise for a few months after a recession has ended. As shown in the chart below, the unemployment rate rose to 7.8% in Virginia and 10.8% in the nation during the 1982 recession, which was the last time the banking system underwent a credit crunch. Four metropolitan areas had an unemployment rate equal to or higher than the nation in March 2009—Danville (12.1%), Blacksburg (9.1%), Bristol (8.8%), and Winchester (8.5%). Northern Virginia had the lowest unemployment rate in the state at 5.2% followed by Charlottesville with 5.8%.

## Unemployment Rate



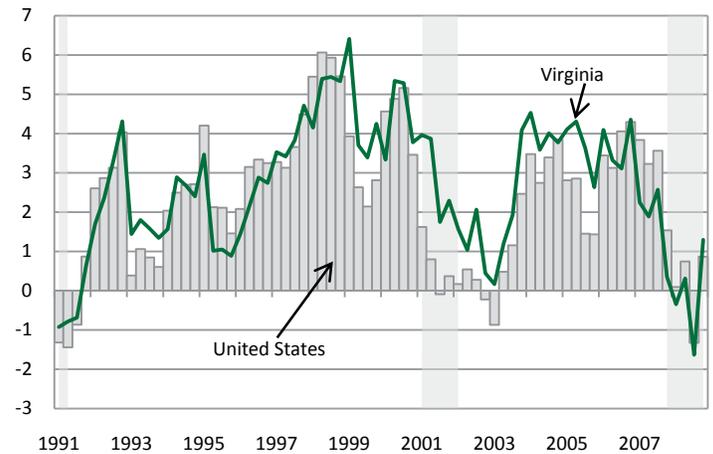
Source: Bureau of Labor Statistics

## Income

This decade, Virginia averaged 2.4% annualized growth in real personal income, outpacing the 1.7% annualized growth in the nation. Nevertheless, income growth in Virginia was under par compared to the nation in 2008 as real personal income dropped 0.1% in Virginia compared to

0.0% in the nation—with Virginia's pace of growth ranking 35th among the fifty states. Personal income is made up of (1) net earnings; (2) dividends, interest, and rent; and (3) transfer receipts. Virginia's growth in 2008 exceeded that in the nation in transfer receipts and net earnings, but trailed in the dividends, interest, and rent component.

## Real Personal Income Growth Percent Change, Year-Over-Year



Source: Bureau of Economic Analysis and Bureau of Labor Statistics

The proportion of income supplied by net earnings decreased in both the state and the nation in 2008. Net earnings consist of wage and salary disbursements, other labor income, and proprietor's income.<sup>35</sup> From 2007 to 2008, the proportion of income from net earnings fell in Virginia from 72.8% to 72.5% while dropping in the nation from 67.7% to 67.1%. The percentage of income supplied by transfer payments (social security, unemployment compensation, welfare, disability payments, etc.) increased in both the state and the nation as one would expect during a period of slow and contracting growth. From 2007 to 2008, the proportion of income provided by transfer payments increased from 11.2% to 11.8% in Virginia and from 14.7% to 15.5% in the nation.

Wages and salaries in Virginia advanced 2.4% in 2008 and are forecast to slow to 0.5% amid the business cycle downturn in 2009 before accelerating modestly to 0.8% in 2010. Among the metro areas, Bristol posted the best wage and salaries growth in 2008 (+4.2%) followed closely by Harrisonburg (+4.1%). Expectations are that wages and salary

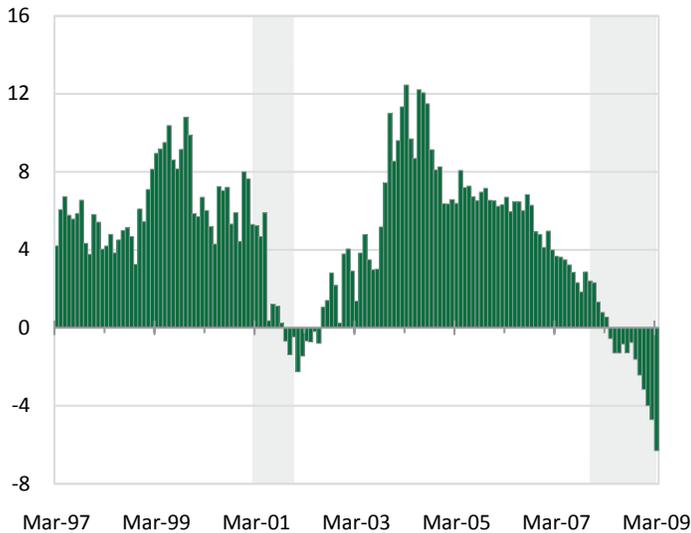
<sup>35</sup>Virginia posted slow growth in proprietor's income in 2007, 0.2% compared to 2.9% in the nation.

growth will generally slow across the state in 2009. The fastest increases in 2009 are projected to be in Hampton Roads (+2.3%) and Charlottesville (+1.0%). In 2010, Hampton Roads (+2.6%) is again expected to have the fastest growth. On the other hand, Winchester posted the slowest wages and salaries growth (+0.1%) in the state in 2008, and a decline (-0.5%) is expected in 2009.

## Retail Sales

Consumer spending in Virginia continued its slowing trend that began in the summer of 2006 and, similar to the nation, slowed significantly since late 2008 when the financial industry crisis accelerated. Over the twelve months ending March 2009, retail sales in the state fell 6.3%. Among the metro areas, sales declines over the prior year were highest in Winchester (-14.4%), Bristol (-7.9%), and Charlottesville (-7.8%). The smallest declines were in Blacksburg (-2.0%), Roanoke (-4.1%), Danville (-4.3%), and Lynchburg (-5.5%).

### Retail Sales, Percent Change Year-Over-Year, Six-Month Moving Average



Source: Virginia Department of Taxation

Real retail sales growth slowed to 0.2% in 2007 and declined 5.4% in 2008. It is expected to decline 4.2% in 2009 before growing 0.1% in 2010. While some of the state metro areas are expected to experience smaller declines in 2009 compared with the prior year (Danville, Hampton Roads, Northern Virginia, and Richmond), most MSAs are forecast to see even slower growth in 2009 than in 2008:

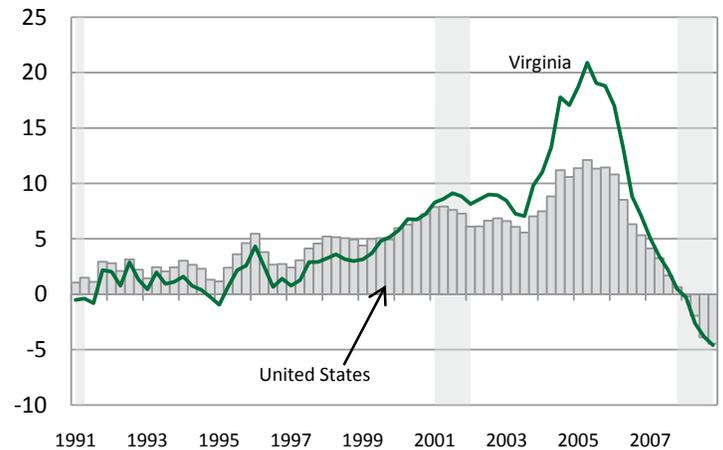
Blacksburg, Bristol, Charlottesville, Harrisonburg, Lynchburg, Roanoke, and Winchester.

## Housing Market

Home sales continued to plummet in Virginia as they have in the nation. The Virginia Association of Realtors reported 81,808 homes sold in the state in 2008, a decline of 14% from 2007. The median sales price in 2008 was \$244,493, down 1.2% from the prior year.

According to the Federal Housing Finance Agency's (FHFA) House Price Index,<sup>36</sup> home prices fell 4.6% in Virginia in the fourth quarter of 2008 compared to a year earlier for the largest decline recorded since the index was begun in 1976. Year-over-year price growth peaked at 20.9% in Virginia in the second quarter of 2005 before consistently decelerating since. Among the metro areas, the largest price declines for the year ending with the fourth quarter of 2008 occurred in Winchester (-17.0%) and Northern Virginia<sup>37</sup> (-12.1%), the two regions that also posted the fastest price growth in 2005. Home price declines also occurred in Danville (-5.4%), Hampton Roads (-3.0%), Charlottesville (-3.8%), and Richmond (-2.0%). Home prices continued to rise in the fourth quarter of 2008 in Bristol (+6.3%), Blacksburg (+0.5%), Harrisonburg (+0.2%), Roanoke (+2.4%), and Lynchburg (+1.8%).

### Home Price Appreciation Percent Change, Year-Over-Year



Source: Federal Housing Finance Agency

The declining housing market has also been apparent in residential building permit activity. Single-family building permits in Virginia (based on a six-month moving average)

<sup>36</sup>The FHFA House Price Index is a weighted repeat sales index and therefore is a true measure of price appreciation as it is not affected by changes in the size or quality of homes sold.

<sup>37</sup>Northern Virginia home prices are based on those of the Washington D.C. metropolitan area.

dropped to 1,106 per month in March 2009, down over 70% from the peak rate reached in December 2004. Over the year ending March 2009, every state metro area<sup>38</sup> except Northern Virginia (-5.4%) and Harrisonburg (-15.1%) posted a decline in permits of 39% or more. The fall in building permits is expected to continue in Virginia though slowing in 2009. Single-family building permits dropped 33.9% in 2008 and are forecast to fall 18.8% in 2009 and then rise 5.5% in 2010. All state metros except Harrisonburg are expected to experience declining permits in 2009. Permits are forecast to rise for all state metro areas in 2010.

With the national recession expected to persist through the end of 2009, employment in Virginia is forecast to contract further. On an annual average basis, job growth slowed in Virginia from 1.0% in 2007 to 0.0% in 2008 and is forecast to decline 1.6% in 2009 and 0.7% in 2010. While most Virginia metro areas are expected to see employment declines in 2009 and 2010, the exceptions are Blacksburg and Lynchburg where growth is expected to be flat or modestly positive in 2010.

The fastest employment declines in 2009 are forecast for the metro areas of Bristol (-3.0%) and Richmond (-3.0%). The manufacturing intensity in the Bristol metro area has contributed to its decline while the concentration of finance and insurance firms in Richmond accelerated its decline. Richmond also suffered the loss of two major firms that filed for bankruptcy—Circuit City and LandAmerica. Both regions are expected to see further decreases in employment in 2010.

The two largest state metros are forecast to experience further contractions in job growth in 2009 and a modest decline in 2010. Northern Virginia employment grew 0.4% in 2008 and is expected to contract 0.9% in 2009 and 0.3% in 2010 as high-tech industry growth slows but federal government employment offsets some of the losses. Hampton Roads employment fell 1.3% in 2008 and is forecast to contract 1.0% in 2009 and 0.3% in 2010. Job growth at Northrop Grumman Shipyard as well as a partnership between Northrop Grumman and AREVA is expected to offset other recession-related losses.

Employment is forecast to decline in 2009 for the remainder of the state. All regions in the state are being affected by the national recession with those regions more dependent on manufacturing and finance and insurance seeing the largest declines. Employment in the non-metropolitan areas is forecast to decline 2.6% in 2009 and 2.2% in 2010.

<sup>38</sup>Single-family building permit data are not available for the Blacksburg metropolitan area, which is therefore excluded from remarks referring to all state metro areas in regards to building permits.

## Virginia Forecast Summary: Most Likely Scenario Annual Average Change

		Actual			Forecast	
	2006	2007	2008	2009	2010	
<b>Blacksburg</b>						
Total Employment*	0.3%	-0.4%	-0.3%	-0.5%	0.0%	
Wages and Salaries**	6.6%	2.8%	0.3%	0.6%	-1.0%	
Real Retail Sales	7.0%	0.1%	-1.4%	-5.6%	9.0%	
Building Permits***	N/A	N/A	N/A	N/A	N/A	
<b>Bristol</b>						
Total Employment*	1.2%	0.0%	0.5%	-3.0%	-1.8%	
Wages and Salaries**	6.8%	2.3%	4.2%	-1.9%	-1.6%	
Real Retail Sales	4.0%	4.1%	-2.1%	-5.0%	-3.4%	
Building Permits	-1.7%	-18.9%	-26.2%	-24.8%	4.8%	
<b>Charlottesville</b>						
Total Employment*	4.3%	2.9%	-0.3%	-2.0%	-1.1%	
Wages and Salaries**	8.8%	6.7%	2.0%	1.0%	0.5%	
Real Retail Sales	0.2%	0.7%	-6.1%	-6.6%	-2.1%	
Building Permits	-17.0%	-15.6%	-29.8%	-22.4%	2.7%	
<b>Danville</b>						
Total Employment*	-4.1%	-1.0%	-0.2%	-1.5%	-0.1%	
Wages and Salaries**	-2.6%	3.6%	0.5%	-0.3%	1.9%	
Real Retail Sales	2.7%	4.8%	-6.2%	-4.8%	-5.4%	
Building Permits	-14.1%	-32.9%	-42.0%	-23.8%	3.5%	
<b>Hampton Roads</b>						
Total Employment*	0.8%	1.1%	-1.3%	-1.0%	-0.3%	
Wages and Salaries**	5.3%	5.2%	2.2%	2.3%	2.6%	
Real Retail Sales	2.8%	0.9%	-7.1%	-3.6%	-0.4%	
Building Permits	-21.1%	-21.8%	-28.9%	-23.0%	3.2%	
<b>Harrisonburg</b>						
Total Employment*	4.8%	-0.2%	0.6%	-1.0%	-0.2%	
Wages and Salaries**	7.1%	5.4%	4.1%	0.7%	0.3%	
Real Retail Sales	3.3%	-2.0%	-2.1%	-5.5%	-2.7%	
Building Permits	-25.3%	-14.0%	-38.6%	8.0%	22.6%	
<b>Lynchburg</b>						
Total Employment*	2.0%	1.0%	1.1%	-0.2%	0.1%	
Wages and Salaries**	6.4%	4.5%	3.5%	0.6%	-1.6%	
Real Retail Sales	8.6%	-1.0%	-0.2%	-3.9%	0.1%	
Building Permits	-0.6%	-18.1%	-41.2%	-18.5%	7.3%	
<b>Northern Virginia</b>						
Total Employment*	2.4%	1.3%	0.4%	-0.9%	-0.3%	
Wages and Salaries**	6.7%	5.5%	2.8%	-0.5%	0.2%	
Real Retail Sales	1.0%	-0.5%	-6.0%	-3.5%	-0.7%	
Building Permits	-36.2%	-22.7%	-34.8%	-12.5%	7.1%	
<b>Richmond</b>						
Total Employment*	1.5%	1.3%	-1.0%	-3.0%	-1.5%	
Wages and Salaries**	4.4%	6.3%	1.8%	0.2%	-0.6%	
Real Retail Sales	4.8%	2.1%	-5.3%	-4.9%	-1.6%	
Building Permits	-15.1%	-23.2%	-32.8%	-35.8%	3.2%	
<b>Roanoke</b>						
Total Employment*	2.0%	0.5%	-0.7%	-1.8%	-1.2%	
Wages and Salaries**	5.5%	5.2%	2.5%	-1.2%	-0.9%	
Real Retail Sales	3.9%	-1.6%	-2.8%	-5.4%	0.4%	
Building Permits	-13.1%	-22.7%	-18.9%	-36.0%	1.2%	
<b>Winchester</b>						
Total Employment*	4.9%	0.0%	-2.9%	-2.5%	-1.1%	
Wages and Salaries**	7.6%	3.4%	0.1%	-0.5%	-0.4%	
Real Retail Sales	0.0%	-6.5%	-9.3%	-12.9%	-8.6%	
Building Permits	-25.3%	-48.4%	-35.5%	-18.3%	15.2%	
<b>Non-MSAs</b>						
Total Employment*	-0.2%	-0.3%	3.9%	-2.6%	-2.2%	
Wages and Salaries**	4.3%	5.6%	2.7%	-2.6%	-1.7%	
Real Retail Sales	2.2%	0.7%	-3.2%	-4.2%	-1.9%	
Building Permits	-21.4%	-29.0%	-44.4%	-33.1%	1.7%	
<b>VA-Totals</b>						
Total Employment*	1.7%	1.0%	0.0%	-1.6%	-0.7%	
Wages and Salaries**	5.8%	5.5%	2.4%	0.5%	0.8%	
Real Retail Sales	2.5%	0.2%	-5.4%	-4.2%	0.1%	
Building Permits	-24.9%	-23.4%	-33.9%	-18.8%	5.5%	

\*Employment refers to nonagricultural employment.

\*\*Wages and salaries include some options that were exercised. Actual data are through the 3rd quarter of 2008.

\*\*\*Since 2005, building permits data are not reported for the Blacksburg metro.

All reported series are seasonally adjusted.

## About Chmura Economics & Analytics

*Chmura Economics & Analytics (Chmura) was founded by Christine Chmura in 1999. The firm specializes in applied economic consulting, quantitative research, and software solutions requiring the integration of advanced economic analysis.*

🔊 **Economic Impact Studies** - Chmura analyzes the economic impact of construction projects, transportation and tourism initiatives, and the relocations of companies and industries.

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*“...a wise and frugal government, which shall restrain men from injuring one another, shall leave them otherwise free to regulate their own pursuits of industry and improvement, and shall not take from the mouth of labor the bread it has earned. This is the sum of good government, and this is necessary to close the circle of our felicities.”*

*—Thomas Jefferson, 1801*

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