Estimating Base Wages and Wage Growth Rates for Workers in the Oil and Natural Gas Industries

Introduction

1. The markets for oil and natural gas are volatile, and supplier characteristics such as output, employment, and wages respond substantially to volatility in oil and gas prices. When estimating base wages and wage growth rates for oil and natural gas extraction workers, failure to account for this volatility can lead to unreasonable projections of future earnings.

2. The techniques described in this memorandum apply to workers in the North American Industry Classification System (NAICS) code group 211-Oil and Gas Extraction, and workers in the NAICS industries 213111- Drilling Oil and Gas Wells and 213112- Support Activities for Oil and Gas Operations. According to the NAICS:

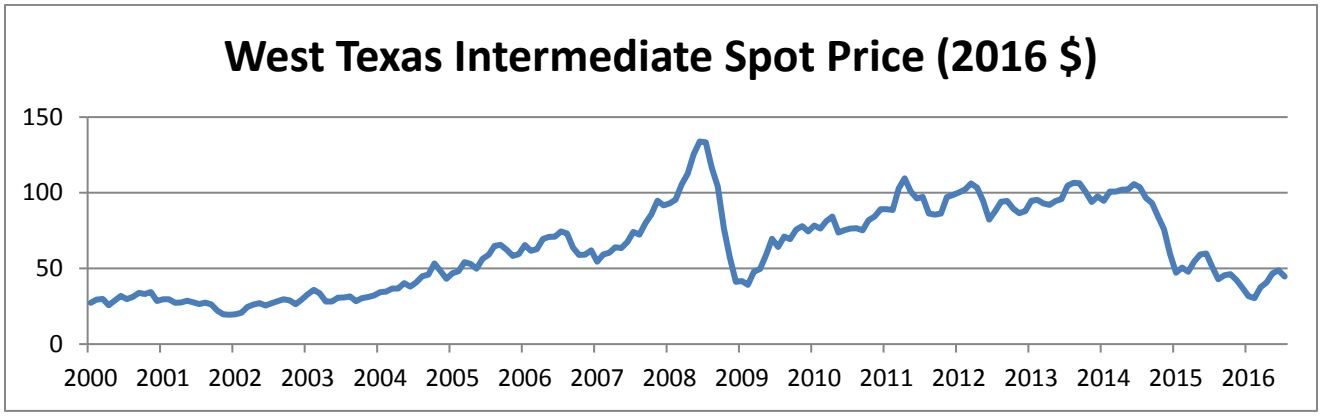
- Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities before the product leaves the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids. Establishments in this subsector include those that operate oil and gas wells on their own account or for others on a contract or fee basis. Establishments primarily engaged in providing support services, on a fee or contract basis, required for the drilling or operation of oil and gas wells (except geophysical

surveying and mapping, mine site preparation, and construction of oil/gas pipelines) are classified in Subsector 213, Support Activities for Mining.[1]

- The Drilling Oil and Gas Wells industry comprises establishments primarily engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, redrilling, and directional drilling.[2]

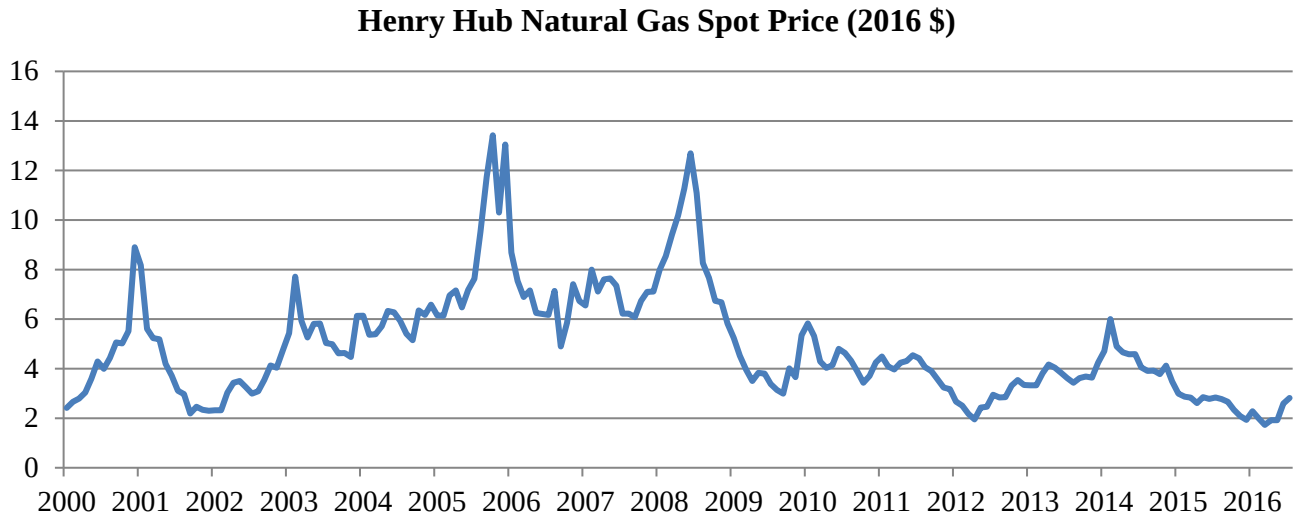
- The Support Activities for Oil and Gas Operations industry comprises establishments primarily engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related construction activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars, well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.[3]

3. The following figures show US oil and gas rig counts, spot prices for oil and natural gas, median annual worker earnings in 2016 dollars, and number employed in oil and natural gas production since 2000.

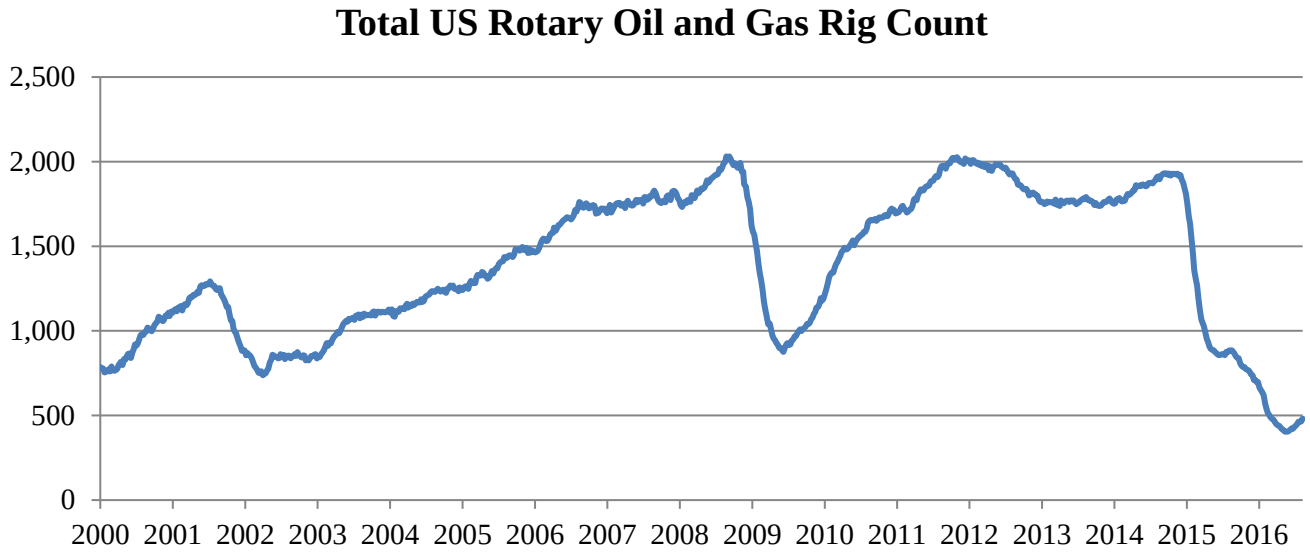


Source: US Energy Information Administration. Available from http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=M

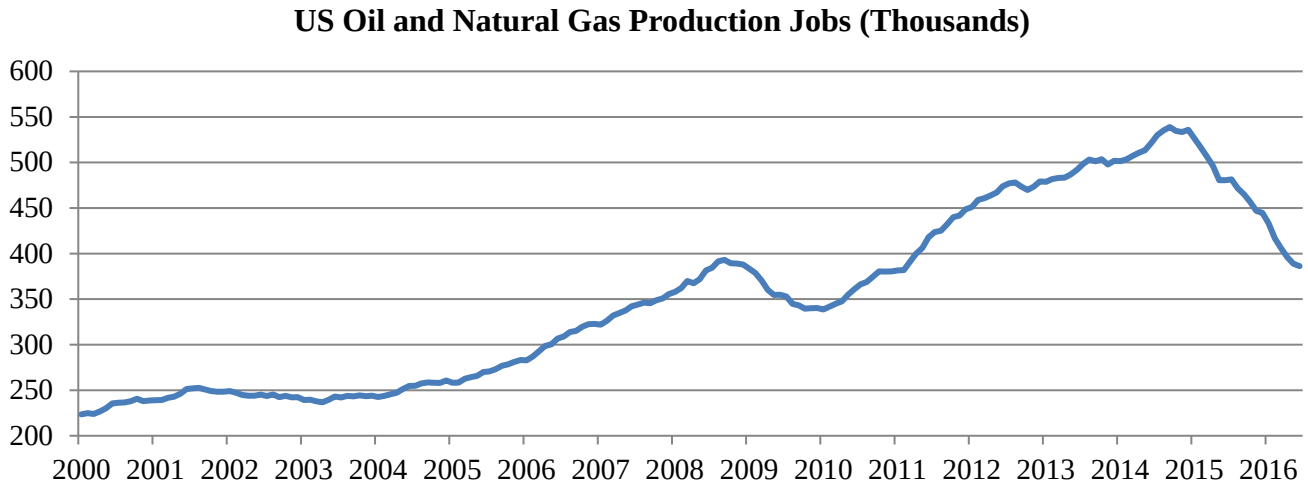
[1] Description of NAICS Code 211- Oil and Gas Extraction. Available from https://siccode.com/en/naicscodes/211/oil-and-gas-extraction-1
[2] Description of NAICS Code 213111- Drilling Oil and Gas Wells. Available from https://siccode.com/en/naicscodes/21311/drilling-oil-and-gas-wells
[3] Description of NAICS Code 213112- Support Activities for Oil and Gas Operations. Available from https://siccode.com/en/naicscodes/213112/support-activities-for-oil-and-gas-operations



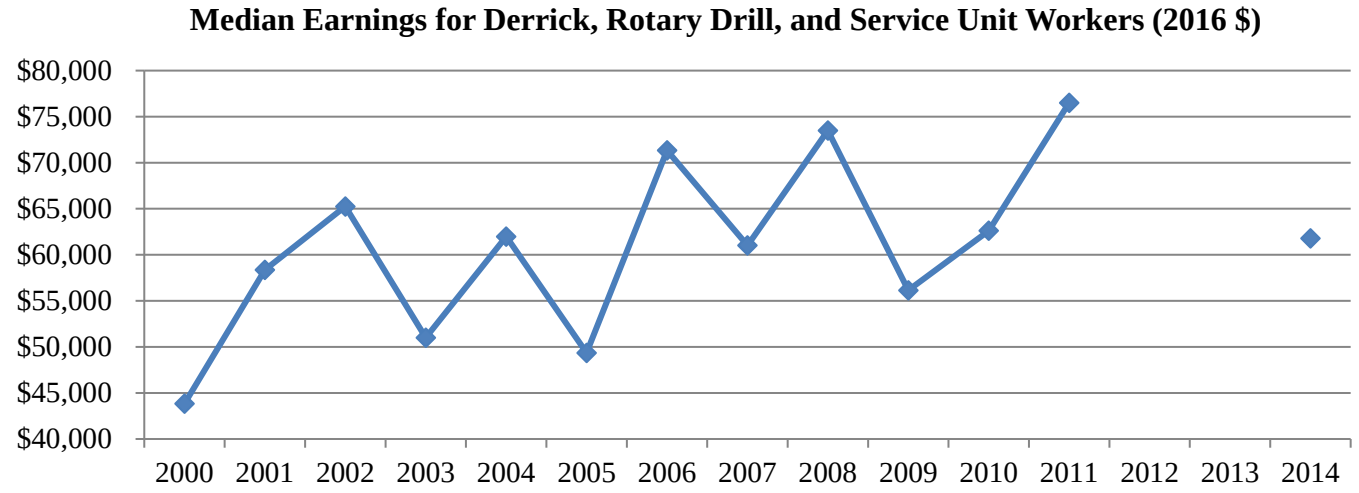
Source: US Energy Information Administration. Available from http://www.eia.gov/dnav/ng/ng_pri_fut_s1_m.htm



Source: Baker Hughes. Available from http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-reportsother



Source: Bureau of Labor Statistics. Total workers in "Support activities for oil and gas operations" and "Oil and gas extraction" Available from www.bls.gov



Source: Bureau of Labor Statistics. Median usual weekly earnings of Derrick, Rotary Drill, and Service Unit Operators, Oil Gas, and Mining. Available from www.bls.gov

Wage Growth

4. Long run growth rates of a cyclical series should be measured from peak to peak or from trough to trough. Earning (including wages, paid leave, and supplemental pay) were in a trough in 2000 and peaked in 2002. Recent industry earnings are harder to judge due to gaps in the data. However, given changes in jobs and rig counts, recent earnings, when available, will likely be a trough. Until data are available for the most recent periods, RPC will measure wage growth from the peak in wages in 2002 to the peak in 2011. In unadjusted dollars, the median annual wage was $49,556 in 2002 and $72,592 in 2011. This makes the annualized nominal

wage growth rate from 2002 to 2011 4.33%. This rate was 1.82% higher than the Consumer Price Index rate of inflation for the same period.

Earnings Growth				
Initial Year	**Initial Median Weekly Earnings**	**Final Year**	**Final Median Weekly Earnings**	**Annual Growth**
2002	$49,556	2011	$72,592	4.33%

Inflation				
Initial Year	**Initial CPI**	**Final Year**	**Final CPI**	**Annual Inflation**
2002	179.900	2011	224.939	2.51%

Real Wage Growth
1.82%

Base Wages

5. Rather than using earnings from a short period (e.g., one to five years) to determine earning capacity for a worker in the oil/natural gas industries, an economist or vocational consultant should usually average earnings over a longer period (ten or more years) to smooth out the effects of industry volatility. Prior to any averaging, earnings (whether individual or industry) should be converted to current dollars. If the worker has earnings from the oil/natural gas industry for ten or more years, the analyst can average that worker's earnings. When a worker has over ten year of earnings the analyst should average the most recent ten years of earnings.

6. If the worker worked fewer than 10 years in the industry, the analyst can compare the worker's earnings with average national earnings for the same period. The formula below applies this comparison to a longer period of average earnings for the industry, smoothing out volatility. The full period considered will be from 2000 onward.

$$\text{Earning Capacity} = \frac{\text{Worker historical avg. earnings}}{\text{Avg. earnings for same years}} (\text{Avg. earnings for full period})$$

Examples

7. Worker A has twelve years of earnings from the oil industry. The most recent 10 years are converted to current dollars and used to create a volatility-smoothed long-run average in the figure below.

Calculation of Base Earnings for Worker A

	(A)	(B)	(C)	(D)
Year	**Worker A's Earnings**	**CPI Inflation**	**Adjustment Factor**	**Worker A's Earnings in 2017 $**
2005	$39,000	3.4%	122.8%	
2006	$47,000	3.2%	119.0%	
2007	$42,000	2.8%	115.7%	$48,608
2008	$54,000	3.8%	111.5%	$60,208
2009	$49,000	-0.4%	111.9%	$54,853
2010	$50,000	1.6%	110.2%	$55,091
2011	$60,000	3.2%	106.8%	$64,059
2012	$65,000	2.1%	104.6%	$67,970
2013	$73,000	1.5%	103.0%	$75,207
2014	$72,000	1.6%	101.4%	$73,009
2015	$65,000	0.1%	101.3%	$65,845
2016	$60,000	1.3%	100.0%	$60,000
2017		0.0%	100.0%	
	Average Earnings (2007-2016)			$62,485

Source: *(A) Historical Earnings for Worker A*

(B) Annual CPI inflation rates from www.bls.gov

(C)RPC Calculation, Current Adjustment Factor = Future Adjustment Factor x (1+ (B))

(D) RPC Calculation, (A) x (C)

8. Worker B has four years of earnings from the oil industry. The figure below converts Worker B's historical earnings to a volatility-smoothed long-run average. This worker's average earnings from 2013 to 2016 were $82,619 in 2017 dollars. This average was 12.9% higher than average earnings for workers in the comparison industries for the same years. Therefore, this worker's volatility-smoothed long-run average earnings are calculated as 12.9% higher than average industry earnings over the long-run period.

Calculation of Base Earnings for Worker B

	(A)	(B)	(C)	(D)	(E)	(F)
Year	**Worker B's Earnings**	**Average Earnings for Oilfield Workers**	**CPI Inflation**	**Adjustment Factor**	**Worker B's Earnings in 2017 $**	**Average Earnings in 2017 $**
2013	$85,000	$71,272	1.5%	103.0%	$87,570	$73,427
2014	$120,000	$74,616	1.6%	101.4%	$121,682	$75,661
2015	$87,000	$68,794	0.1%	101.3%	$88,131	$69,689
2016	$63,000	$74,759	1.3%	100.0%	$63,000	$74,759
2017			0.0%	100.0%		$ -
			Period Average (G)		$82,619	$73,165
			Worker B/Average Ratio (H)		1.129	
			Long-run Average (2000-2016) (I)			$62,958
			Ratio-Adjusted Worker B Earnings (J)		$71,093	

Source: *(A) Historical Earnings for Worker B*
(B) Average earnings of Production and non-supervisory employees in Oil and gas extraction, www.bls.gov
(C) Annual CPI inflation rates from www.bls.gov
(D) RPC Calculation, Current Adjustment Factor = Future Adjustment Factor x (1+ (B))
(E) RPC Calculation, (A) x (D)
(F) RPC Calculation, (B) x (D)
(G) Averages of (E) and (F) in years where both have available data
(H) First value in (G) / second value in (G)
(I) Average of (F) from 2000 to 2016
(J) RPC calculation, (I) x (H)