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Overview of the
Norwegian Asset Accounts for Oil and Gas, 1991 - 2002.

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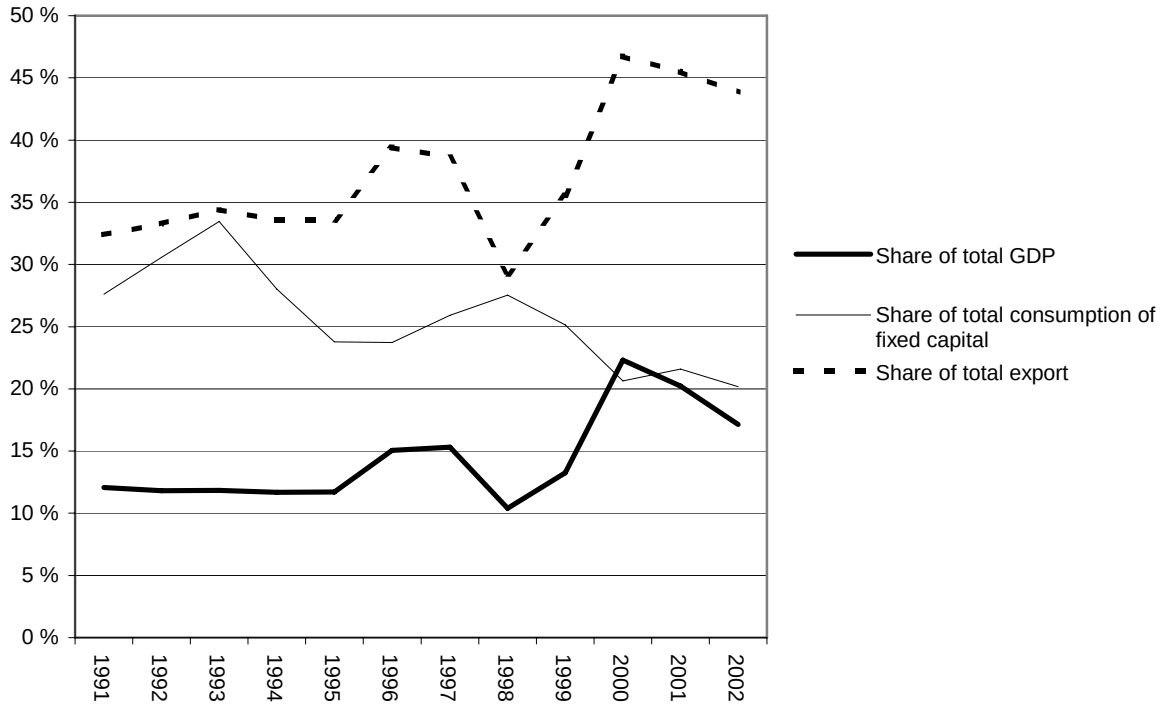
1 INTRODUCTION

In the late 1960's oil was discovered on the Norwegian Continental shelf, and oil extraction started in 1971. The oil and gas industries are very important contributors to GDP in Norway (see table 1.1), and have been a driving force in Norwegian economic development for several decades. The oil and gas extraction from the Norwegian Continental shelf has increased extensively the last ten years. With a production of oil and NGL of 3.3 mill barrels per day in 2003 Norway was the third largest exporter of oil in the world.

Table 1.1: Macroeconomic indicators for the petroleum sector in Norway
(Source: Norwegian National Accounts 1991 - 2002)



The oil and gas industries create considerable values for the Norwegian society. Remaining oil and gas reserves on the Norwegian shelf still have a large value, and it is therefore of great interest to have appropriate and solid methods to calculate the value of the remaining oil and gas resources. The purpose of the asset accounts for oil and gas is to be able to capture the economic importance of these natural resources.

Statistics Norway is now reporting assets accounts for oil/NGL (Natural Gas Liquids) and gas annually to Eurostat. The work with the asset accounts for oil/NGL and gas started in 1997, as part of the first phase of the NOREEA (NORwegian Economic and Environmental Accounts) Project.

This paper presents the results for the Norwegian assets accounts for oil/NGL and gas for the period 1991 to 2002, and gives an overview of the methods and sources used when calculating these assets accounts. The guidelines given by Eurostat task force on subsoil assets, presented in "Subsoil asset accounts for oil and gas - Guidelines for the set of standard tables", are primarily used as theoretical background for the calculations (see chapter 6).

Chapter 2 gives an overview of the items of the physical accounts of oil/NGL and gas resources in Norway, while chapter 3 gives and overview of their value. Chapter 4 presents alternative values of

the closing stock of oil/NGL and gas for 2001 based on other assumptions than what is used in the standard calculations.

2 PHYSICAL ACCOUNTS FOR OIL AND GAS

The stocks of oil/NGL and gas reserves are seldom known with certainty. There is uncertainty related to both the volume of oil/NGL and gas in the reserves and the profitability of exploitation.

2.1 Classification of oil and gas reserves

There is no established international classification system for the physical oil/NGL and gas resources, and the institutions compiling volume data for oil/NGL and gas are classifying the resources according to the data availability and their users' need. This might cause harmonisation problems between countries when comparing data in this area.

When focusing on the economical aspects of the oil/NGL and gas resources, it has been common practice to classify the oil/NGL and gas reserves according to the profitability of exploitation. The reserve sizes are therefore under constant revision as a result of changing economic and technological conditions and new discoveries. On this basis, the practice has been to classify the total reserves of oil/NGL and gas based on the degree of certainty that the reserves will be exploited. Eurostat recommends touse the following three categories when classifying oil and gas reserves:

- Proven reserves, which are reserves almost certain (90 percent or more) to be technically and economically producible given the current technology and relative prices.
- Probable reserves, which are reserves not yet proven, but are estimated to have more than 50 percent chance of being technically and economically producible.
- Possible reserves, which are at present not regarded as probable, but are estimated to have a significant, but less than 50 percent chance of being exploitable.

2.2 What data to include in the physical balance sheets and accumulation accounts

Physical accounts for subsoil assets include balance sheets accounts showing the stock at a certain time, and accumulation accounts showing changes in the stocks between two points in time.

ESA recommends to include only proven reserves in the subsoil asset accounts, while Eurostat recommends to include all "economical recoverable" resources, which they define as proven, probable and possible reserves, as well as undiscovered reserves. To include only proven reserves is according to Eurostat not representative of the overall volume of reserves of oil/NGL and gas present. This is explained by the often very high cost of proving new reserves, and oil companies will normally only define reserves as exploitable for a limited time of extraction (5-10 years).

Table 2.1 and table 2.2 in chapter 2.3 show one option (used when reporting data to Eurostat) to how physical data for oil/NGL and gas and changes in the reserve estimates between two points in time can be reported. The physical balance sheet account consists of the following elements:

- The *Opening stock,* which consist of discovered and undiscovered reserves, and should be equal to the closing stock of the previous year.
- *Extraction,* which refers to the volume extracted during the year, and should only come from proven economic developed reserves.

- *Other changes in volume*, which group together discoveries, revisions of previous estimates, and changes due to changes in price and classifications, i.e. it includes all changes in the stock level from the beginning to the end of the year, except extraction. If the data are available, discoveries should be shown separately. When undiscovered reserves are included in the stock estimates, discoveries will reflect a reclassification from undiscovered to discovered reserves.
- *Closing stock*, which refers to discovered and undiscovered reserves at the end of the year. Data on the closing stocks of the different sub-categories should be provided as well.

2.3 The Norwegian physical accounts for oil/NGL and gas

In Norway, the official stock estimates for oil/NGL and gas reserves are made by the Norwegian Petroleum Directorate (NPD), based upon reports submitted by all operating companies on the Norwegian continental shelf. NPD operates with 3 main categories (possibilities of dividing these categories into more detailed ones) of oil and gas reserves that combined are defined as "total recoverable resources". The three main categories are "Reserves", "Discovered resources" and "Undiscovered resources". The Norwegian figures reported as discoveries in table 2.1 and table 2.2, summarise the NPD resource classes of "reserves" and "discovered resources".

But NPD changed their way of categorising oil and gas resources in both 1984 and in 2001. The lack of continuity in the way NPD classifies the oil and gas reserves has caused difficulties for making comparable time series for the Norwegian oil/NGL and gas asset accounts. This is the reason why we are not able to report data for the period prior to 1984. The NPD also changed the classification system in 2001, so there is a break in the series in that year. This mainly affects the distribution between proven and other discovered reserves, while the total discovered and undiscovered reserves are comparable.

Table 2.1 and table 2.2 show the physical balance sheet and accumulation accounts respectively for oil/NGL and for gas for the period 1991 to 2001. These tables are identical with the data reported annual to Eurostat.

Table 2.1: Physical balance sheet and accumulation account for oil/NGL in million tonnes, 1991 - 2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Opening stock: Discovered and undiscovered reserves	2918	2870	3494	3521	3494	3469	4123	4069	3868	3698	3732	3558
Extraction	-93	-107	-114	-129	-139	-155	-157	-151	-151	-159	-163	-150
Other changes in volume	45	732	140	102	114	809	103	-51	-19	192	-11	-3
Discoveries		40	4	55	42	42	93	50	42	29	25	9
Closing stock: Discovered and undiscovered reserves	2870	3494	3521	3494	3469	4123	4069	3868	3698	3732	3558	3405
Discovered reserves	1678	2250	2276	2287	2304	2946	2892	2710	2573	2597	2364	2211
Proven reserves									1423	1520	1551	1395
Other discovered reserves									1150	1076	813	816
Undiscovered reserves	1191	1245	1245	1207	1165	1177	1177	1158	1125	1135	1194	1194

Table 2.2: Physical balance sheet and accumulation account for natural gas in billion standard cubic meters (Sm^3), 1991 - 2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Opening stock: Discovered and undiscovered reserves	5059	4970	5167	5215	4957	5010	5489	5670	6087	6114	6355	6343
Extraction	-25	-26	-25	-27	-28	-37	-43	-44	-48	-50	-53	-65
Other changes in volume	-64	223	73	-231	81	516	224	461	75	291	41	-101
Discoveries		5	19	55	80	35	206	60	60	120	21	5
Closing stock: Discovered and undiscovered reserves	4970	5167	5215	4957	5010	5489	5670	6087	6114	6355	6343	6177
Discovered reserves	2740	2757	2805	2867	3000	3419	3600	3769	3796	3954	3833	3667
Proven reserves									1247	1259	2189	2117
Other discovered reserves									2549	2695	1644	1550
Undiscovered reserves	2230	2410	2410	2090	2010	2070	2070	2318	2318	2400	2510	2510

Table 2.1 and table 2.2 show that the extraction of oil/NGL and gas has increased from 1991 to 2002.

The extraction of oil/NGL has increased annually, except from 1997 to 1998 and from 2001 to 2002. But, the extraction levels of oil/NGL were both in 1997 and 2001 record high. The extraction of gas has been rising every year from 1993 to 2002, with a record high level of extraction in 2002.

The level of the closing stocks of oil/NGL and gas are both higher in 2002 compared to 1991. The closing stocks of oil/NGL showed a rising trend from 1991 to 1997. From 1998 and onwards, the closing stocks of oil/NGL have decreased, mostly due to high extraction levels and negative other changes in volume, and is in 2002 at approximately the same level as in 1992. The closing stocks of gas have increased substantially from 1991 to 2002. From 1999 to 2002, the level of the closing stock has been relatively unchanged, while at the same time there have been record high extraction levels of gas.

The development in the physical data seen in Norway is mainly due to improved knowledge of the geology of the continental shelf, which led to large upward reassessments of the stocks of both oil and gas.

3 MONETARY ACCOUNTS FOR OIL AND GAS

The monetary value of the stock of oil/NGL and gas reserves is an indicator of the national wealth that is associated with oil/NGL and gas. The monetary valuation is based on the estimates of the physical stock.

3.1 How to value oil and gas resources

In the national accounts, the preferred valuation method for assets is based on the prices obtained in market transactions at the time to which the balance sheet relates. Oil/NGL and gas fields consist of produced assets and non-produced assets (reserves before exploitation). Since no market transactions of subsoil assets in the ground take place in Norway, the reserves will have to be valued using an indirect method.

There are several indirect methods to choose from when valuing oil and gas resources. The method recommended by Eurostat is the present value method. Using the present value method, the monetary value of the oil and gas resources is calculated as the present value of the expected future net resource rent from oil/NGL and gas.

The present value at the beginning of the period t, PV_t, is expressed as:

$$PV_t = \sum_{i=t}^{t+1} \frac{R_i}{(1+r)^{i-t+1}}$$

where R_i is the net resource rent in period *i*, and *r* is the discount rate.

In order to use the present value method to value the oil and gas resources, it is necessary to calculate the resource rent for oil/NGL and gas (chapter 3.2), as well as to forecast future resource rent (chapter 3.3) and to choose a discount rate (chapter 3.3).

3.2 Calculating the resource rent for oil and gas

Since oil/NGL and gas are exhaustible resources where the total possible extraction is limited, the resources have a so-called economic scarcity price called the economic rent or the resource rent that represents the net return to the subsoil assets. The resource rent is the net income from extraction, defined as the value of output less all costs of extraction.

There are various formulas for calculating the resource rent, see for example Lindholt (On Natural Resource Rent and the Wealth of a Nation A Study Based on National Accounts in Norway 1930-95, Discussion paper no 281, Statistics Norway, 2000), Brekke, Lone and Rødseth (Economy and Ecology - Tools for an sustainable policy, Notam Gyldendal, 1997) and guidelines from Eurostat (see chapter 6), all with small differences regarding how to define total value of both output and costs related to extraction.

The Norwegian asset accounts for oil and gas reported to Eurostat, are based on the definition of the resource rent recommended by Eurostat:

Output (basic "well head" prices)
+ Specific taxes less subsidies on products
– Intermediate consumption
– Compensation of employees
– Other non-specific taxes less subsidies on production
– Consumption of fixed capital
– Return to fixed capital
= Resource rent

An equivalent definition of the resource rent is:

Net operating surplus
+ Specific taxes less subsidies on products
+ Other specific taxes less subsidies on production
– Return to fixed capital
= Resource rent

Most of the variables are standard national accounts variables, except the return to fixed capital and the classification of taxes and subsidies into specific and non-specific. The national accounts data used for the oil/NGL and gas industry is equivalent to the NACE Rev.1 group 11.1 (Extraction of crude petroleum and natural gas).

3.2.1 Choosing a normal rate of return to fixed capital

Return to fixed capital is calculated by applying a normal real rate of return to the net stock of fixed capital in the extraction industry.

Eurostat sees the return to fixed capital as an opportunity cost of the investments in the assets, which can be estimated using the average real rate of return on investment elsewhere in the economy. Eurostat concluded that for European Economic Area countries, an 8 percent rate of return to fixed capital should be taken as the default value in the absence of more detailed information.

An 8 percent rate of return to fixed capital is used in the Norwegian data on asset accounts for oil and gas. The choice is supported in a Norwegian government report on Cost-Benefit analysis (Cost-benefit analysis, NOU 1997:27, The Norwegian Ministry of Finance) where 8 percent is suggested as a reasonable rate for projects with a certain degree of risk. Oil and gas exploration is included in the stock of fixed capital and is also given the 8 percent return.

3.2.2 Defining specific and non-specific taxes and subsidies

When calculating the resource rent using the definition given by Eurostat, net specific taxes are included in the resource rent. Also for the purpose of allocating the resource rent between the government and the extractor, net taxes should be divided into two groups: taxes specific to oil and gas extraction (including 'specific' taxes on production) and taxes of a more general nature. Eurostat defines specific taxes and specific subsidies as those that apply only to the oil and gas extraction industry, while non-specific taxes and subsidies apply to other industries as well.

The government's part of the resource rent consists, in addition to the specific taxes, also of taxes on income (and royalties). The remaining of the total resource rent is then the extractor's part.

In the Norwegian National Accounts, all other taxes on production paid by the oil and gas industry (NACE 11.1) and all other subsidies on production received by the oil and gas industry are defined as specific ones. Other taxes on production paid by the oil and gas industry in Norway consist of a tax on production, an area tax and a tax on CO_2-emission in the extraction industry. None of the taxes or subsidies on products paid or received by the oil and gas industry are considered to be specific ones.

3.2.3 Distribution of total resource rent between oil and gas

Because oil/NGL and gas are sold in different markets and normally have different production profiles, it is useful for valuation to estimate resource rents for oil and gas separately. The Norwegian National Accounts figures for production costs of the oil/NGL and gas industry (NACE Rev.1 group 11.1) are not divided between oil/NGL and gas. Because of this, additional assumptions have to be made in order to calculate separate resource rents for oil/NGL and gas. In the Norwegian assets accounts reported to Eurostat, the resource rent between oil/NGL and gas are divided in proportion to the output value.

3.2.4 Decommissioning costs

Decommissioning costs are still very low in Norway, but are expected to increase in the years to come. Decommissioning costs are included as part of the intermediate consumptions in the resource rent calculations. No further forecasts about future decommissioning costs are included in the calculations.

3.2.4 Norwegian resource rent for oil and gas

Table 3.1 shows the Norwegian resource rent calculations for the period 1991 to 2002. The figures for 2002 are based on preliminary figures from the Norwegian National Accounts.

Table 3.1: Resource rent for oil/NGL and gas resources in Norway, mill NOK, 1991-2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002*
Current transactions												
Output (basic "well head" prices)	110648	112975	122588	125271	129162	179059	189567	138523	187393	350912	337977	295383
Intermediate consumption	20262	22559	26831	26040	22545	28755	26001	26522	29338	29308	31845	31755
Gross value added	90386	90416	95757	99231	106617	150304	163566	112001	158055	321604	306131	263628
Compensation of employees	7720	8500	9587	9937	9789	9921	10223	10489	11919	11949	12697	13654
Other taxes on production	10446	10628	10797	9359	9035	10287	9918	7546	7080	6669	6366	4821
Other subsidies on production	-3	-2	-15	-17	-16	-29	-119	-86	-28	-3	-3	-2
Consumption of fixed capital	25946	27989	30590	32959	34987	37129	39254	42536	46836	50075	52657	51643
Construction, equipment, etc. for extraction	20839	22162	24303	26628	28708	30707	32591	35287	39083	42722	45387	44958
Mineral exploration	5107	5827	6287	6331	6279	6422	6663	7249	7753	7353	7270	6685
Net operating surplus	46277	43301	44798	46993	52822	92996	104290	51516	92248	252914	234414	193512
Closing net stocks of fixed assets	273623	298764	328176	345085	360997	382020	414612	460471	492931	513298	538836	528106
Resource rent	36177	32037	31679	30081	34234	74374	83527	25807	62462	220146	199713	155224
= Net operating surplus	46277	43301	44798	46993	52822	92996	104290	51516	92248	252914	234414	193512
+ Specific taxes less subsidies on products	0	0	0	0	0	0	0	0	0	0	0	0
+ Other specific taxes less subsidies on production	10443	10626	10782	9342	9019	10258	9799	7460	7052	6666	6363	4819
- Return to fixed capital (8%)	-20543	-21890	-23901	-26254	-27607	-28880	-30562	-33169	-36838	-39434	-41064	-43107
Resource rent appropriated by the government	22660	21512	19570	20042	21345	34379	30447	8290	21426	88043	93560	90549
= Specific taxes less subsidies on products	0	0	0	0	0	0	0	0	0	0	0	0
+ Other specific taxes less subsidies on production	10443	10626	10782	9342	9019	10258	9799	7460	7052	6666	6363	4819
+ Rent (royalties) on subsoil assets	0	0	0	0	0	0	0	0	0	0	0	0
+ Specific taxes on income	12217	10886	8788	10700	12326	24121	20648	830	14374	81377	87197	85730
Resource rent for the extractor	13517	10525	12109	10039	12889	39996	53081	17517	41036	132102	106153	64675
= Net operating surplus	46277	43301	44798	46993	52822	92996	104290	51516	92248	252914	234414	193512
- Rent (royalties) on subsoil assets	0	0	0	0	0	0	0	0	0	0	0	0
- Specific taxes on income	-12217	-10886	-8788	-10700	-12326	-24121	-20648	-830	-14374	-81377	-87197	-85730
- Return to capital	-20543	-21890	-23901	-26254	-27607	-28880	-30562	-33169	-36838	-39434	-41064	-43107
Resource rent, oil, 8% rate of return	31458	28307	28297	27073	30814	66571	72199	20984	54579	191182	163807	124526
Resource rent, gas, 8% rate of return	4719	3730	3382	3008	3421	7803	11328	4824	7883	28963	35906	30698

The resource rent for oil/NGL and gas is very volatile, especially due to changes in oil and gas prices and due to assumptions made in relation to the normal rate of return to fixed capital. From 1991 to 1997, the resource rent for oil/NGL and gas more than doubles. But, from 1997 to 1998 it falls dramatically. This fall in the resource rent is explained by a 50.6 percent decrease in the net operating

surplus from 1997 to 1998, which can be seen in connection with the reduction in the extraction level of oil/NGL combined with falling oil prices.

From 1999 on, the resource rent increases again, with historical high levels in 2000 and 2001. The value of output increases due to increased oil prices and high extraction levels, while extraction costs are relatively stable.

The division of the resource rent between oil/NGL and gas has not changed much from 1991 to 2002, but one can observe a change at the end of this period when the resource rent related to natural gas extraction is increasing. The share of the resource rent related to oil/NGL extraction is still the highest, with a share of 80 percent in 2002 against 87 percent in 1991.

The division of the resource rent between the government and the extractor has to a large extent varied between 1991 and 2002. This can directly be related to the level of taxes defined as specific ones to the extraction industry..

3.3 Forecast of future resource rent

Making a forecast of the future resource rent requires assumptions about the development of prices, extraction costs and the level of extraction. For accounting purposes, Eurostat has advised to use relatively simple and transparent assumptions. When making forecasts of the future resource rent, it is recommended to divide the resource rent into two components, rent per unit extracted and the level of extraction,

3.3.1 Future prices of oil/NGL and gas (rent per unit extracted)

Oil/NGL and gas prices vary considerable due to unpredictable activities and factors. Eurostat therefore recommends to assume a constant future resource unit rent (resource rent per unit extracted) when making forecasts of the future resource rent. Since fluctuations in the prices influence the resource rent and hence the value of the oil/NGL and gas reserves, it is recommended to use a constant unit rent equal to a three-year average of the unit rents (converted to the prices in the current year before the average is calculated). This will smoothen the price fluctuations.

We have followed the recommendations from Eurostat task force on subsoil assets, using a three-year average unit rent in constant prices when valuing the oil/NGL and gas resources.

C.3.2 Future extraction levels

If available, it is recommended to use explicit forecasts of the future extraction paths for oil and gas. If no specific information is available, the estimates should be based on a constant level of extraction, equal to extraction in the year the estimates refer to.

We have used a constant level of extraction (same as current year's extraction) when valuing the oil/NGL and gas resources.

The Ministry of Finance and the Ministry of oil and gas make production forecasts for oil and gas, but these predictions are so far not included as part of the assets accounts for oil and gas reported to Eurostat.

3.4 Choosing a discount rate

The discount rate reflects the investor's time preference and attitude towards risk. It is often assumed that governments have a lower rate of time preferences and less aversion to risk than private investors. It is thus appropriate to use a lower discount rate when present values are calculated from the government's point of view, rather than from the point of view of private investors.

The valuation of the oil/NGL and gas resources is highly dependent on the choice of the discount rate. Eurostat concluded that the rate of discount should be considered as a "social rate" of discount. A value of 4 percent was decided acceptable, since the governments in Europe are the legal owners of most of the oil and gas fields. 4 percent was estimated to be close to the average real rate on government bonds.

We have used a discount rate equal to 4 percent when valuing the oil and gas resources.

3.5 The Norwegian monetary accounts for oil and gas

A more detailed formula of the present value given in chapter 3.1 can be presented as:

$$PV_t(rr_t, E_t) = \frac{rr_t e_{t+1}}{(1+r)} + \frac{rr_t e_{t+2}}{(1+r)^2} + \frac{rr_t e_{t+3}}{(1+r)^3} + ... + \frac{rr_t e_{t+n}}{(1+r)^n}$$

PV_t is the present value calculated at the end of year t, which is a function of the unit rent, future extraction and the discount rate. rr_t is the three-year moving average unit rent for year t, e_t is extraction in year t, E_t is the expectation in year t of future annual extraction from year t+1 until the stock is exhausted in year t+n, i.e. it is a vector (e_{t+1}, e_{t+2},….., e_{t+n}) and r is the rate of discount (which is assumed to be constant over time),

Table 3.2 and table 3.3 show the Norwegian monetary balance sheet and accumulation account for oil/NGL and gas respectively.

Table 3.2: Norwegian monetary balance sheet and accumulation account for oil/NGL, mill nok, 1991-2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002*
Opening stock	493633	546139	547380	483804	476560	621965	924600	863836	771859	1291812	2029712	2400423
Nominal holding gains and losses	18314	-82384	-80985	-31832	128464	177856	-58894	-55246	554333	683673	418625	-307094
Neutral holding gains and losses	14315	9284	10948	7257	12391	9951	20341	26779	16981	47797	77129	33606
Real holding gains and losses	3999	-91668	-91932	-39089	116073	167905	-79235	-82025	537352	635876	341496	-340700
Other changes in volume	43174	91694	25312	34286	31363	144083	16917	-19665	-3734	105868	20359	-66886
Extraction	-31187	-30287	-27572	-29149	-39877	-57060	-54093	-48623	-83544	-134895	-167022	-133926
Revaluation due to time passing	22205	22218	19668	19450	25455	37756	35305	31557	52898	83254	98748	81058
Closing stock	546139	547380	483804	476560	621965	924600	863836	771859	1291812	2029712	2400423	1973576

Table 3.3: Norwegian monetary balance sheet and accumulation account for gas, mill nok, 1991-2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002*
Opening stock	89763	100430	100234	81868	82690	103520	182234	208547	197836	331686	580275	763443
Nominal holding gains and losses	11467	-2151	-16082	-5268	17148	34674	-2299	-15455	106934	225419	141634	-49446
Neutral holding gains and losses	2603	1707	2005	1228	2150	1656	4009	6465	4352	12272	22050	10688
Real holding gains and losses	8864	-3859	-18087	-6496	14998	33018	-6308	-21920	102582	213146	119584	-60134
Other changes in volume	-799	1958	-2283	6092	3686	44061	28658	4777	27003	23324	41805	149301
Extraction	-4019	-4011	-3276	-3310	-4145	-7311	-8389	-7948	-13358	-23371	-30820	-35350
Revaluation due to time passing	4017	4009	3275	3308	4141	7290	8344	7915	13271	23217	30549	34532
Closing stock	100430	100234	81868	82690	103520	182234	208547	197836	331686	580275	763443	862480

The total value of the Norwegian oil/NGL and gas resources in 2002 is calculated to be 2 836 056 million NOK, with 1 973 576 million NOK related to the oil/NGL resources and 862 480 million NOK related to the gas resources. Although the physical reserves of the gas reserves (measured in oil equivalents) are bigger than the oil/NGL reserves, the total value of the natural gas resources is lower than the value of the oil/NGL resources. This is mainly due to the lower price of natural gas compared to oil/NGL and that the expected extraction path of natural gas is much longer that the expected extraction path of oil/NGL.

4 Sensitivity analysis

The calculated presents values are sensitive to changes in the assumptions made on the discount rate and normal rate of return to fixed capital. Table 4.1 gives example on how the value of closing stock of oil/NGL and gas differ due to different assumptions for 2001. The shaded cells represent the "standard" set of assumptions used in table 3.1, 3.2 and 3.3.

Table 4.1: Value of closing stock of oil and gas, based on different assumptions (2001)

	Crude oil and NGL				Natural gas			
	Unit rent				Unit rent			
	3-year moving average			Current year	3-year moving average			Current year
	Rate of return			Rate of return	Rate of return			Rate of return
Discount rate	**6 %**	**8 %**	**10 %**	**8 %**	**6 %**	**8 %**	**10 %**	**8 %**
0 %	3 837 564	3 642 625	3 447 687	3 572 506	3 887 416	3 688 484	3 489 551	4 297 258
2 %	3 085 579	2 928 839	2 772 100	2 872 460	1 472 270	1 396 929	1 321 588	1 627 489
4 %	2 528 884	2 400 423	2 271 962	2 354 215	804 618	763 443	722 268	889 447
6 %	2 109 744	2 002 574	1 895 404	1 964 025	540 859	513 181	485 504	597 881
8 %	1 788 942	1 698 068	1 607 195	1 665 381	405 984	385 208	364 433	448 786

5 Concluding remarks

This paper gives an overview of the methods and sources that forms the basis for the Norwegian assets accounts for oil and gas. Only the figures for the physical and monetary accounts for the period 1991 to 2002 are included, even though figures back to 1984 are reported to Eurostat.

Although we are able to present assets accounts for oil and gas for the time period 1984 - 2002, there are some remaining challenges and problems related to these calculations. So far, the problems we are facing are overcome by following the recommendations given by Eurostat. But, further examination of the following issues will be in focus in the future work and development of the Norwegian assets accounts for oil and gas:

- Evaluate the effects of alternative predictions of future extraction levels. (In the ongoing project "Calculation of the Norwegian National Wealth" led by the Ministry of Finance, another extraction path than the one recommended by Eurostat is used).
- Evaluate the use of alternative rates of discounts.
- Evaluate the use of alternative normal returns to fixed capital.
- How to calculate the government's share of the revenues from oil and gas extraction? (Some problems are due to former state owned oil companies that now are being partly privatised).
- Evaluate alternative ways to incorporate decommissioning costs.

6 References

The following reports from Eurostat are the main sources used when calculating the Norwegian Asset Accounts for oil/NGL and gas:

Eurostat: Accounts for subsoil assets – results of pilot studies in European countries. Theme 2, Economy and Finance. European Commission, 2000

Eurostat: Natural Resource Accounts for Oil and Gas 1980-2000. Theme 2, Economy and Finance. European Commission, 2002

Eurostat: Summary of conclusions and results – revised version. Eurostat Task Force on Subsoil Assets. Luxembourg, September 1999.

Eurostat: Subsoil Asset Accounts for Oil and Gas – Guidelines for the set of standard tables, Revised version, Luxembourg, January 2003.