ENE434 Lab 1

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```
if (!require('pacman')) install.packages('pacman')
## Loading required package: pacman
p_load(tidyverse, ggmap, ggplot2, stats)
oil_fields = data.frame(read_csv("http://jmaurit.github.io/analytics/labs/data/oil_fields_cross.csv"))
## New names:
## * '' -> ...1
## Rows: 101 Columns: 8
## -- Column specification -----
## Delimiter: ","
## chr (1): name
## dbl (6): ...1, lon, lat, recoverable_oil, remaining_oil, total.invest
## date (1): producing_from
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
oil_fields
##
       ...1
                        name
                                   lon
                                            lat recoverable_oil remaining_oil
               33/9-6 DELTA
## 1
         1
                                   NA
                                            NA
                                                            NA
                                                                           NA
## 2
         6
                 ALBUSKJELL 2.993019 56.63079
                                                           7.4
                                                                          0.0
## 3
        46
                        ALVE 7.827906 65.96924
                                                           1.9
                                                                          0.8
                                                          37.2
## 4
                    ALVHEIM
                             2.010224 59.57465
                                                                         17.5
        54
## 5
        64
                     ÅSGARD
                             6.728537 65.11635
                                                          100.4
                                                                         18.6
## 6
        82
                        ATLA
                             2.577873 59.67057
                                                            0.3
                                                                         0.3
## 7
        85
                     BALDER
                             2.446895 59.30631
                                                          72.1
                                                                         16.2
## 8
        109
                      BLANE
                             2.473427 56.88505
                                                            0.8
                                                                          0.3
## 9
                             1.848627 59.32033
        118
                      BØYLA
                                                           3.4
                                                                          3.4
## 10
                      BRAGE 3.014216 60.58058
                                                          59.3
                                                                          4.0
        121
## 11
                   BRYNHILD 2.297317 57.49330
        146
                                                           3.6
                                                                          3.6
## 12
        149
                         COD 2.422911 57.06647
                                                           2.9
                                                                          0.0
```

146.7

569.2

4.8

14.9

0.0

129.8

DRAUGEN 7.756043 64.33243

EKOFISK 3.218287 56.54663

EDDA 3.103594 56.47110

13

14

15

190

216

257

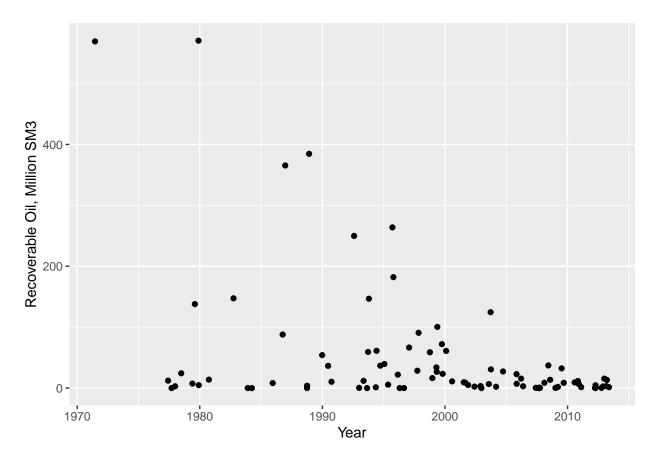
##		301	ELDFISK		56.39870	137.9	37.3
	17	341	EMBLA		56.32710	11.9	1.5
##	18	365	ENOCH		58.64759	0.4	0.1
##	19	374	FRAM		61.01547	30.7	5.9
##	20	391	FRIGG	2.094430	59.91108	0.0	0.0
##	21	428	FR∅Y	2.556764	59.73203	5.6	0.0
##	22	450	GAUPE	1.931471	57.96129	0.2	0.1
##	23	454	GIMLE	2.317010	61.24770	3.0	0.4
##	24	464	GINA KROG	NA	NA	NA	NA
##	25	468	GJØA	3.945822	61.33418	11.6	6.4
##	26	485	GLITNE	1.647140	58.71153	8.9	0.0
##	27	499	GOLIAT	22.296546	71.27406	30.2	30.2
##	28	504	GRANE	2.506074	59.18574	124.6	36.1
##	29	520	GUDRUN	1.751611	58.84938	11.7	11.7
	30	524	GULLFAKS		61.20896	365.5	11.6
	31	557	GULLFAKS SØR		61.10673	58.8	16.6
	32	575	GUNGNE		58.30961	0.0	0.0
	33	594	GYDA		56.85435	36.5	0.9
	34	620	HEIDRUN		65.32944	182.1	40.1
	35	648	HEIMDAL		59.58547	8.2	1.6
	36	681	HOD		56.19843	10.4	0.9
##		707	HULDRA		60.85444	5.1	0.0
	38	723	HYME		64.34594	3.2	3.2
	39	726	ISLAY	NA	NA	0.0	0.0
##		730	JETTE		59.39335	1.5	1.5
##		733	JOTUN		59.42954	23.4	0.7
	42	752	KNARR		61.80114	11.9	11.9
	43	755	KRISTIN		64.97139	22.9	6.0
			KVITEBJØRN				
	44 45	768	LILLE-FRIGG		61.09226 59.95617	27.3	9.8
	45	782				1.3	0.0
##	46	802	MARTIN LINGE		60.50824	6.0	6.0
	47	808	MARULK		65.95250	0.7	0.6
##	48	813	MIKKEL		64.68017	6.6	3.3
##	49	826	MIME		57.12693	0.4	0.0
	50	832	MORVIN		65.15322	9.3	5.6
	51	839	MURCHISON		61.40133	13.9	0.0
##		879	NJORD		64.28369	28.5	3.0
##		898	NORDØST FRIGG		60.00514	0.0	0.0
##		917	NORNE		66.03421	90.8	3.8
##		937	ODIN		60.06075	0.0	0.0
##		960	ORMEN LANGE		63.49258	0.0	0.0
##		971	OSEBERG		60.54786	384.6	22.7
##		1002	OSEBERG ØST		60.61807	26.7	7.9
##		1020	OSEBERG SØR		60.25226	61.0	17.2
##		1039	OSELVAR		56.93144	4.6	4.5
##		1044	ØST FRIGG		59.91862	0.0	0.0
##		1068	REV		58.02975	0.7	0.0
##		1081	RINGHORNE ØST		59.29083	15.5	6.3
##		1090	SIGYN		58.28605	0.0	0.0
##		1104	SKARV		65.72231	15.5	15.5
##		1116	SKIRNE		59.61747	2.2	0.5
##		1129	SKULD		66.23375	13.4	13.4
##	68	1132	SLEIPNER ØST	1.967779	58.43631	0.0	0.0
##	69	1159	SLEIPNER VEST	1.730038	58.44112	0.0	0.0

```
SNØHVIT 20.974280 71.49443
                                                      0.0
                                                                     0.0
## 70 1182
## 71 1194
                  SNORRE 2.193464 61.49258
                                                      249.9
                                                                     64.1
## 72 1220
                 STATFJORD 1.866338 61.26222
                                                     570.4
                                                                     4.3
## 73 1260 STATFJORD NORD 1.940215 61.44457
                                                      39.5
                                                                     3.0
## 74
     1284
            STATFJORD ØST 2.003245 61.33880
                                                      36.8
                                                                     0.7
## 75
     1308
                    SYGNA 2.003040 61.47588
                                                      11.0
                                                                     1.1
## 76
     1323
                    TAMBAR 2.963593 56.97054
                                                      9.5
                                                                     0.6
## 77
     1337
                TAMBAR ØST 3.002542 56.97172
                                                       0.3
                                                                     0.0
## 78
      1344 TOMMELITEN GAMMA
                           2.927906 56.48807
                                                       3.9
                                                                     0.0
                                                      24.3
## 79
     1369
                       TOR 3.329413 56.64148
                                                                     0.4
## 80
     1409
                   TORDIS 2.117935 61.28220
                                                      61.2
                                                                     6.0
     1432
                    TROLL 3.552057 60.82293
                                                      263.8
## 81
                                                                     36.0
      1460
                      TRYM 4.236097 56.40414
                                                       1.5
## 82
                                                                     0.8
                      TUNE 2.653474 60.43847
## 83
     1465
                                                       3.3
                                                                     0.0
## 84
     1481
                  TYRIHANS 7.000546 64.79362
                                                      32.4
                                                                    16.5
## 85
      1491
                    ULA
                           2.860582 57.10273
                                                      87.9
                                                                    15.7
## 86
      1522
                      URD 8.181120 66.05629
                                                       7.0
                                                                     2.0
     1533
                     VALE 2.302589 59.70584
## 87
                                                       2.4
                                                                     1.1
## 88
     1549
                  VALEMON 2.355820 61.04258
                                                       4.9
                                                                     4.9
                   VALHALL 3.393803 56.27577
## 89
     1553
                                                     147.4
                                                                    41.5
## 90
                                                      16.4
     1590
                      VARG 1.908065 58.07247
                                                                     1.4
## 91 1608
                      VEGA 3.353838 61.35584
                                                       6.6
                                                                     5.1
## 92 1616
               VESLEFRIKK 2.891658 60.78827
                                                      54.1
                                                                     1.8
## 93 1643
               VEST EKOFISK 3.085798 56.56262
                                                       12.2
                                                                     0.0
              VIGDIS 2.147171 61.40055
## 94 1684
                                                      66.6
                                                                    15.0
## 95 1704
                    VILJE 2.275522 59.66342
                                                      13.6
                                                                     6.2
## 96 1713
                   VISUND 2.558184 61.41580
                                                      33.9
                                                                    11.5
## 97 1732
                VISUND SØR 2.345196 61.29676
                                                       2.7
                                                                     2.7
## 98 1735
                   VOLUND 1.946607 59.48411
                                                       8.6
                                                                     4.0
## 99 1745
                    VOLVE 1.890830 58.43905
                                                       8.7
                                                                     1.0
                       YME 4.362773 57.74885
                                                      22.0
## 100 1754
                                                                    14.1
## 101 1796
                YTTERGRYTA 7.515016 65.11059
                                                      0.3
                                                                     0.0
##
      producing_from total.invest
## 1
             <NA>
                            0
          1979-05-26
## 2
                            2752
## 3
          2009-03-19
                            3864
## 4
          2008-06-08
                           17708
## 5
          1999-05-19
                           65301
## 6
          2012-10-07
                           324
## 7
                           23198
          1999-10-02
## 8
          2007-09-12
                           544
## 9
           <NA>
                            85
## 10
          1993-09-23
                           17062
## 11
                           210
           <NA>
## 12
          1977-12-26
                            1003
## 13
                           23291
          1993-10-19
## 14
          1979-12-02
                           2157
## 15
          1971-06-15
                           94172
## 16
          1979-08-08
                           34963
## 17
                            3129
          1993-05-12
## 18
          2007-05-31
                            208
## 19
          2003-10-02
                            9875
## 20
          1977-09-13
                            8614
## 21
         1995-05-15
                            5551
```

## 22	2012-03-31	2085
## 23	2006-05-19	780
## 24	<na></na>	0
## 25	2010-11-07	28043
## 26	2001-08-29	2536
## 27	<na></na>	10182
## 28	2003-09-23	19746
## 29	<na></na>	5857
## 30	1986-12-22	74940
## 31	1998-10-10	28340
## 32	1996-04-21	1930
## 33	1990-06-21	12435
## 33 ## 34	1995-10-18	52935
## 35	1985-12-13	10064
## 36	1990-09-30	2254
## 37	2001-11-21	7460
## 38	2013-03-02	897
## 39	2012-04-10	578
## 40	2013-05-20	263
## 41	1999-10-25	9484
## 42	<na></na>	534
## 43	2005-11-03	24467
## 44	2004-09-26	13707
## 45	1994-05-13	3923
## 46	<na></na>	402
## 47	2012-04-02	2173
## 48	2003-08-01	2182
## 49	1993-01-01	324
## 50	2010-08-01	7994
## 51	1980-09-28	2597
## 52	1997-09-30	14888
## 53	1983-12-01	1816
## 54	1997-11-06	23806
## 55	1984-04-01	2614
## 56	2007-09-13	35967
## 57	1988-12-01	66622
## 58	1999-05-03	8827
## 59 ## 60	2000-02-05	20108
## 60	2012-04-14	3535
## 61	1988-10-01	2186
## 62	2009-01-24	3831
## 63	2006-03-19	738
## 64	2002-12-22	2066
## 65	2013-01-01	37119
## 66	2004-03-03	2685
## 67	2013-03-19	1434
## 68	1993-08-24	26756
## 69	1996-08-29	23176
## 70	2007-08-21	8235
## 71	1992-08-03	65475
## 72	1979-11-24	65264
## 73	1995-01-23	5719
## 74	1994-09-24	6015
## 75	2000-08-01	1984

```
## 76
           2001-07-15
                              2212
## 77
           2007-10-02
                              1034
## 78
           1988-10-03
                              2406
## 79
           1978-06-28
                              3934
## 80
           1994-06-03
                             12201
## 81
           1995-09-19
                            130620
## 82
           2011-02-12
                              2956
## 83
           2002-11-28
                              4746
## 84
           2009-07-08
                             15203
## 85
           1986-10-06
                             14700
## 86
           2005-11-08
                              5073
## 87
           2002-05-31
                              2495
## 88
                 <NA>
                              1484
## 89
           1982-10-02
                             61511
## 90
                              7880
           1998-12-22
## 91
           2010-12-02
                              8503
## 92
           1989-12-26
                             16660
## 93
           1977-05-31
                               943
## 94
                             14829
           1997-01-28
## 95
           2008-08-01
                              1947
## 96
           1999-04-21
                             22136
## 97
           2012-11-22
                               826
## 98
           2009-09-10
                              3185
## 99
           2008-02-12
                              3044
## 100
           1996-02-27
                             23438
## 101
           2009-01-05
                              1460
str(oil_fields)
                   101 obs. of 8 variables:
## 'data.frame':
## $ ...1
                    : num 1 6 46 54 64 82 85 109 118 121 ...
                     : chr "33/9-6 DELTA" "ALBUSKJELL" "ALVE" "ALVHEIM" ...
## $ name
## $ lon
                     : num NA 2.99 7.83 2.01 6.73 ...
## $ lat
                     : num NA 56.6 66 59.6 65.1 ...
## $ recoverable_oil: num NA 7.4 1.9 37.2 100.4 ...
## $ remaining_oil : num NA 0 0.8 17.5 18.6 0.3 16.2 0.3 3.4 4 ...
## $ producing_from : Date, format: NA "1979-05-26" ...
   $ total.invest
                    : num 0 2752 3864 17708 65301 ...
head(oil_fields$recoverable_oil)
## [1]
              7.4
                     1.9 37.2 100.4 0.3
class(oil_fields$name)
## [1] "character"
oil_fields %>% ggplot(aes(x = producing_from, y = recoverable_oil)) +
  geom_point() +
  labs(x = "Year", y = "Recoverable Oil, Million SM3")
```

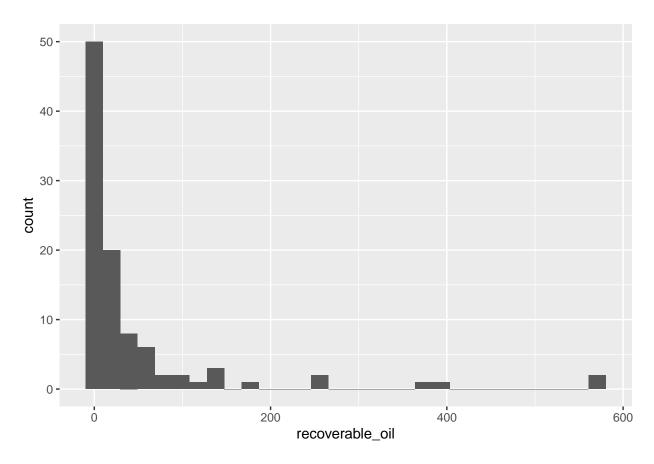
Warning: Removed 9 rows containing missing values (geom_point).



```
ggplot(oil_fields, aes(x=recoverable_oil)) +
geom_histogram()
```

'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.

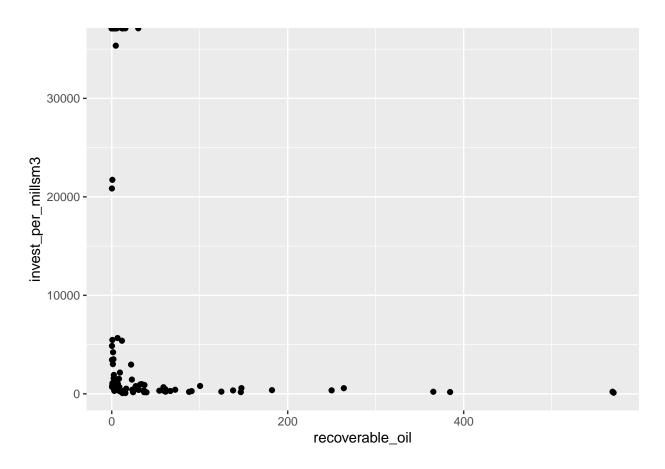
Warning: Removed 2 rows containing non-finite values (stat_bin).



```
oil_fields$extracted = oil_fields$recoverable_oil - oil_fields$remaining_oil
oil_fields$invest_per_millsm3 = oil_fields$total.invest / oil_fields$extracted
```

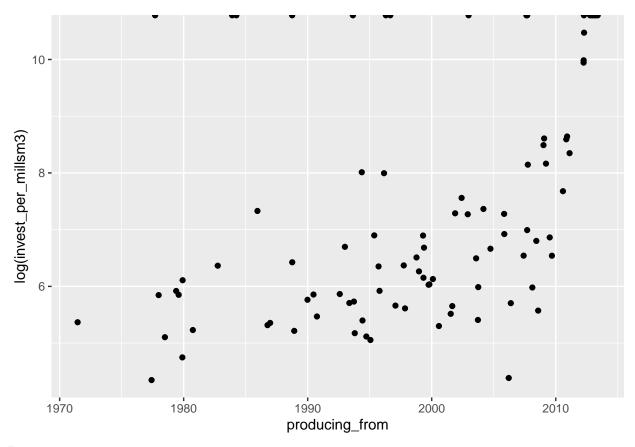
```
ggplot(oil_fields, aes(x = recoverable_oil, y = invest_per_millsm3)) +
  geom_point()
```

Warning: Removed 2 rows containing missing values (geom_point).



```
ggplot(oil_fields, aes(x = producing_from, y = log(invest_per_millsm3))) +
  geom_point()
```

Warning: Removed 9 rows containing missing values (geom_point).



Exercises:

- 1) What does the special tax treatment imply about the initial investment costs of Norwegian offshore oil and gas investments?
- 2) Who is in effect paying for most of the upfront investment costs? Is this warranted/problematic?
- 3) If we know that there was a high risk that oil and gas production would not be profitable (or allowed) in the near future (10-30 years), would the tax system be neutral?

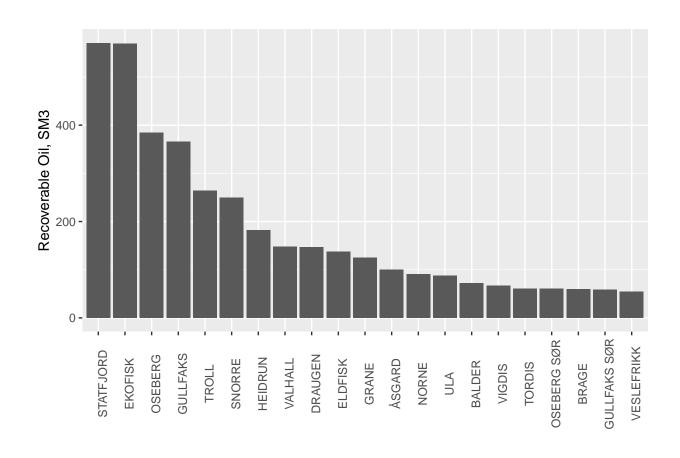
```
big_oil_fields = oil_fields %>% filter(recoverable_oil > 50)
big_oil_fields$name
```

```
"BRAGE"
    [1] "ÅSGARD"
                         "BALDER"
                                                          "DRAUGEN"
                                                                          "EKOFISK"
##
    [6]
        "ELDFISK"
                         "GRANE"
                                         "GULLFAKS"
                                                          "GULLFAKS SØR"
                                                                          "HEIDRUN"
   [11]
        "NORNE"
                         "OSEBERG"
                                         "OSEBERG SØR"
                                                          "SNORRE"
                                                                          "STATFJORD"
   [16] "TORDIS"
                         "TROLL"
                                         "ULA"
                                                          "VALHALL"
                                                                          "VESLEFRIKK"
   [21] "VIGDIS"
```

```
big_oil_fields = arrange(big_oil_fields, desc(recoverable_oil))
big_oil_fields
```

```
##
      ...1
                    name
                               lon
                                        lat recoverable_oil remaining_oil
              STATFJORD 1.866338 61.26222
## 1
      1220
                                                       570.4
                                                                        4.3
## 2
       257
                 EKOFISK 3.218287 56.54663
                                                       569.2
                                                                      129.8
       971
                 OSEBERG 2.722425 60.54786
                                                       384.6
                                                                       22.7
## 3
```

```
## 4
       524
               GULLFAKS 2.130364 61.20896
                                                       365.5
                                                                       11.6
## 5
     1432
                   TROLL 3.552057 60.82293
                                                       263.8
                                                                       36.0
      1194
                                                       249.9
## 6
                  SNORRE 2.193464 61.49258
                                                                       64.1
                HEIDRUN 7.306980 65.32944
## 7
       620
                                                       182.1
                                                                       40.1
## 8
      1553
                 VALHALL 3.393803 56.27577
                                                       147.4
                                                                       41.5
## 9
       190
                DRAUGEN 7.756043 64.33243
                                                       146.7
                                                                       14.9
## 10
       301
                ELDFISK 3.242870 56.39870
                                                                       37.3
                                                       137.9
                   GRANE 2.506074 59.18574
## 11
       504
                                                       124.6
                                                                       36.1
## 12
        64
                 ÅSGARD 6.728537 65.11635
                                                       100.4
                                                                       18.6
## 13
      917
                  NORNE 8.147307 66.03421
                                                        90.8
                                                                        3.8
## 14 1491
                     ULA 2.860582 57.10273
                                                        87.9
                                                                       15.7
## 15
                  BALDER 2.446895 59.30631
                                                        72.1
                                                                       16.2
        85
                 VIGDIS 2.147171 61.40055
## 16 1684
                                                        66.6
                                                                       15.0
                  TORDIS 2.117935 61.28220
## 17 1409
                                                        61.2
                                                                        6.0
## 18 1020
            OSEBERG SØR 2.760004 60.25226
                                                                       17.2
                                                        61.0
## 19
       121
                   BRAGE 3.014216 60.58058
                                                        59.3
                                                                        4.0
## 20
       557 GULLFAKS SØR 2.215286 61.10673
                                                        58.8
                                                                       16.6
             VESLEFRIKK 2.891658 60.78827
                                                        54.1
                                                                        1.8
##
      producing_from total.invest extracted invest_per_millsm3
## 1
          1979-11-24
                             65264
                                        566.1
                                                         115.2871
## 2
          1971-06-15
                             94172
                                        439.4
                                                         214.3195
## 3
          1988-12-01
                             66622
                                        361.9
                                                         184.0895
## 4
                             74940
                                        353.9
                                                         211.7547
          1986-12-22
## 5
          1995-09-19
                            130620
                                        227.8
                                                         573.3977
## 6
          1992-08-03
                             65475
                                        185.8
                                                         352.3950
## 7
          1995-10-18
                             52935
                                        142.0
                                                         372.7817
## 8
          1982-10-02
                             61511
                                        105.9
                                                         580.8404
## 9
          1993-10-19
                             23291
                                        131.8
                                                         176.7147
## 10
          1979-08-08
                             34963
                                        100.6
                                                         347.5447
## 11
          2003-09-23
                             19746
                                         88.5
                                                         223.1186
## 12
          1999-05-19
                             65301
                                         81.8
                                                         798.3007
## 13
          1997-11-06
                             23806
                                         87.0
                                                         273.6322
## 14
          1986-10-06
                             14700
                                         72.2
                                                         203.6011
## 15
          1999-10-02
                             23198
                                         55.9
                                                         414.9911
## 16
          1997-01-28
                             14829
                                         51.6
                                                         287.3837
          1994-06-03
## 17
                                                         221.0326
                             12201
                                         55.2
## 18
          2000-02-05
                             20108
                                         43.8
                                                         459.0868
## 19
          1993-09-23
                             17062
                                         55.3
                                                         308.5353
## 20
          1998-10-10
                             28340
                                         42.2
                                                         671.5640
## 21
          1989-12-26
                             16660
                                         52.3
                                                         318.5468
ggplot(big_oil_fields, aes(x=reorder(name, -recoverable_oil), y=recoverable_oil)) +
  geom_col() +
  theme(axis.text.x = element_text(angle = 90)) +
  labs(x="", y="Recoverable Oil, SM3")
```



```
library(ggmap)

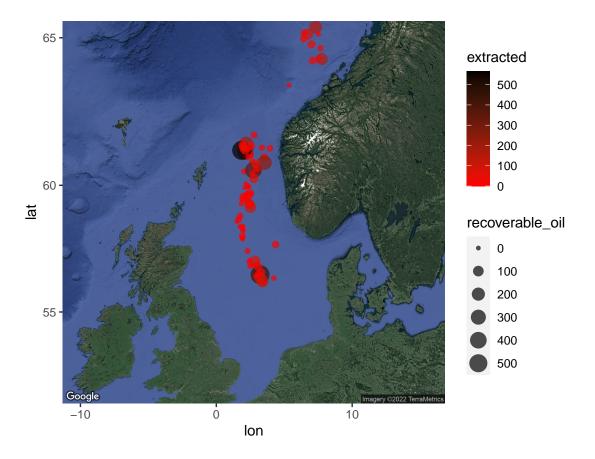
maps_api_key <- Sys.getenv('GOOGLE_API_KEY')
maps_api_key = Sys.getenv('GOOGLE_API_KEY')
register_google(key = maps_api_key)

northsea=get_googlemap(center = c(lon = 2.74, lat = 59.00), zoom=5, maptype="satellite")</pre>
```

Source : https://maps.googleapis.com/maps/api/staticmap?center=59,2.74&zoom=5&size=640x640&scale=2&m

```
ggmap(northsea) +
geom_point(aes(x = lon, y = lat, size=recoverable_oil, color=extracted),alpha=.7, data = oil_fields)+
scale_color_continuous(low="red", high="black")
```

Warning: Removed 11 rows containing missing values (geom_point).



Exercises

oil_fields

##		1	name	lon	lat	recoverable_oil	remaining_oil
##	1	1	33/9-6 DELTA	NA	NA	NA	NA
##	2	6	ALBUSKJELL	2.993019	56.63079	7.4	0.0
##	3	46	ALVE	7.827906	65.96924	1.9	0.8
##	4	54	ALVHEIM	2.010224	59.57465	37.2	17.5
##	5	64	ÅSGARD	6.728537	65.11635	100.4	18.6
##	6	82	ATLA	2.577873	59.67057	0.3	0.3
##	7	85	BALDER	2.446895	59.30631	72.1	16.2
##	8	109	BLANE	2.473427	56.88505	0.8	0.3
##	9	118	BØYLA	1.848627	59.32033	3.4	3.4
##	10	121	BRAGE	3.014216	60.58058	59.3	4.0
##	11	146	BRYNHILD	2.297317	57.49330	3.6	3.6
##	12	149	COD	2.422911	57.06647	2.9	0.0
##	13	190	DRAUGEN	7.756043	64.33243	146.7	14.9
##	14	216	EDDA	3.103594	56.47110	4.8	0.0
##	15	257	EKOFISK	3.218287	56.54663	569.2	129.8
##	16	301	ELDFISK	3.242870	56.39870	137.9	37.3
##	17	341	EMBLA	3.249919	56.32710	11.9	1.5
##	18	365	ENOCH	1.523260	58.64759	0.4	0.1
##	19	374	FRAM	3.528545	61.01547	30.7	5.9
##	20	391	FRIGG	2.094430	59.91108	0.0	0.0
##	21	428	FR∅Y	2.556764	59.73203	5.6	0.0

##	22	450	GAUPE	1 031/71	57.96129	0.2	0.1
	23	454	GIMLE		61.24770	3.0	0.4
##	24	464	GINA KROG	2.317010 NA	NA	NA	NA
##	25	468	GJØA		61.33418	11.6	6.4
##	26	485	GLITNE		58.71153	8.9	0.0
##	27	499		22.296546		30.2	30.2
##	28				59.18574		
##	29	504 520	GRANE GUDRUN		58.84938	124.6	36.1
	30		GULLFAKS		61.20896	11.7	11.7
	31	524 557	GULLFAKS SØR		61.10673	365.5 58.8	11.6 16.6
	32					0.0	
	33	575	GUNGNE		58.30961		0.0
		594	GYDA		56.85435	36.5	0.9
	34	620	HEIDRUN		65.32944	182.1	40.1
	35	648	HEIMDAL		59.58547	8.2	1.6
	36	681	HOD		56.19843	10.4	0.9
	37	707	HULDRA		60.85444	5.1	0.0
	38	723	HYME		64.34594	3.2	3.2
	39	726	ISLAY	NA O 350070	NA	0.0	0.0
##		730	JETTE		59.39335	1.5	1.5
##		733	JOTUN		59.42954	23.4	0.7
	42	752	KNARR		61.80114	11.9	11.9
##		755	KRISTIN		64.97139	22.9	6.0
##		768	KVITEBJØRN		61.09226	27.3	9.8
##		782	LILLE-FRIGG		59.95617	1.3	0.0
	46	802	MARTIN LINGE		60.50824	6.0	6.0
##		808	MARULK		65.95250	0.7	0.6
##	48	813	MIKKEL		64.68017	6.6	3.3
##	49	826	MIME		57.12693	0.4	0.0
##	50	832	MORVIN		65.15322	9.3	5.6
	51	839	MURCHISON		61.40133	13.9	0.0
##	52	879	NJORD		64.28369	28.5	3.0
	53	898	NORDØST FRIGG		60.00514	0.0	0.0
	54	917	NORNE		66.03421	90.8	3.8
##	55	937	ODIN		60.06075	0.0	0.0
	56	960	ORMEN LANGE		63.49258	0.0	0.0
	57	971	OSEBERG		60.54786	384.6	22.7
##		1002	OSEBERG ØST		60.61807	26.7	7.9
##		1020	OSEBERG SØR	2.760004		61.0	17.2
##		1039	OSELVAR		56.93144	4.6	4.5
##		1044	ØST FRIGG		59.91862	0.0	0.0
##		1068	REV		58.02975	0.7	0.0
##		1081	RINGHORNE ØST		59.29083	15.5	6.3
	64	1090	SIGYN		58.28605	0.0	0.0
##		1104	SKARV		65.72231	15.5	15.5
##		1116	SKIRNE		59.61747	2.2	0.5
##		1129	SKULD			13.4	13.4
##		1132	SLEIPNER ØST		58.43631	0.0	0.0
##		1159	SLEIPNER VEST		58.44112	0.0	0.0
##		1182		20.974280		0.0	0.0
##		1194	SNORRE		61.49258	249.9	64.1
##		1220	STATFJORD		61.26222	570.4	4.3
##		1260	STATFJORD NORD		61.44457	39.5	3.0
##		1284	STATFJORD ØST		61.33880	36.8	0.7
##	75	1308	SYGNA	2.003040	61.47588	11.0	1.1

```
TAMBAR 2.963593 56.97054
                                                                        0.6
## 76 1323
                                                         9.5
## 77
      1337
                 TAMBAR ØST 3.002542 56.97172
                                                          0.3
                                                                        0.0
     1344 TOMMELITEN GAMMA
                                                         3.9
                                                                        0.0
## 78
                            2.927906 56.48807
     1369
                        TOR 3.329413 56.64148
                                                        24.3
                                                                        0.4
## 79
## 80
      1409
                     TORDIS
                             2.117935 61.28220
                                                         61.2
                                                                        6.0
## 81
      1432
                     TROLL
                             3.552057 60.82293
                                                        263.8
                                                                       36.0
## 82
     1460
                      TRYM 4.236097 56.40414
                                                         1.5
                                                                        0.8
## 83
      1465
                       TUNE
                             2.653474 60.43847
                                                          3.3
                                                                        0.0
## 84
      1481
                   TYRIHANS
                             7.000546 64.79362
                                                         32.4
                                                                       16.5
                                                        87.9
## 85
      1491
                     ULA
                             2.860582 57.10273
                                                                       15.7
## 86
      1522
                        URD
                            8.181120 66.05629
                                                         7.0
                                                                        2.0
      1533
                       VALE
                            2.302589 59.70584
                                                         2.4
## 87
                                                                        1.1
                             2.355820 61.04258
## 88
                    VALEMON
      1549
                                                         4.9
                                                                        4.9
## 89
      1553
                    VALHALL
                             3.393803 56.27577
                                                       147.4
                                                                       41.5
## 90
      1590
                       VARG
                             1.908065 58.07247
                                                        16.4
                                                                        1.4
## 91
      1608
                       VEGA
                             3.353838 61.35584
                                                         6.6
                                                                        5.1
## 92
      1616
                 VESLEFRIKK
                             2.891658 60.78827
                                                         54.1
                                                                        1.8
## 93
      1643
               VEST EKOFISK 3.085798 56.56262
                                                        12.2
                                                                        0.0
## 94
      1684
                     VIGDIS 2.147171 61.40055
                                                         66.6
                                                                       15.0
                      VILJE 2.275522 59.66342
## 95
      1704
                                                         13.6
                                                                        6.2
                     VISUND 2.558184 61.41580
                                                        33.9
## 96
     1713
                                                                       11.5
## 97
      1732
                 VISUND SØR 2.345196 61.29676
                                                         2.7
                                                                        2.7
                            1.946607 59.48411
## 98 1735
                     VOLUND
                                                         8.6
                                                                        4.0
## 99 1745
                      VOLVE 1.890830 58.43905
                                                         8.7
                                                                        1.0
                        YME 4.362773 57.74885
## 100 1754
                                                        22.0
                                                                       14.1
## 101 1796
                 YTTERGRYTA 7.515016 65.11059
                                                                        0.0
##
      producing_from total.invest extracted invest_per_millsm3
## 1
                <NA>
                             0
                                      NA
## 2
          1979-05-26
                                       7.4
                             2752
                                                    371.89189
## 3
          2009-03-19
                             3864
                                      1.1
                                                    3512.72727
                                      19.7
## 4
          2008-06-08
                            17708
                                                    898.88325
## 5
          1999-05-19
                            65301
                                      81.8
                                                    798.30073
## 6
                              324
                                      0.0
          2012-10-07
                                                          Inf
## 7
          1999-10-02
                            23198
                                      55.9
                                                    414.99106
## 8
                            544
                                                    1088.00000
          2007-09-12
                                       0.5
## 9
            <NA>
                              85
                                       0.0
                                                          Inf
## 10
          1993-09-23
                            17062
                                      55.3
                                                    308.53526
## 11
                <NA>
                             210
                                       0.0
                                                          Inf
## 12
          1977-12-26
                             1003
                                       2.9
                                                    345.86207
## 13
                            23291
                                      131.8
          1993-10-19
                                                    176.71472
## 14
          1979-12-02
                            2157
                                      4.8
                                                    449.37500
## 15
          1971-06-15
                            94172
                                      439.4
                                                    214.31953
## 16
          1979-08-08
                            34963
                                      100.6
                                                    347.54473
## 17
          1993-05-12
                             3129
                                      10.4
                                                    300.86538
## 18
          2007-05-31
                             208
                                      0.3
                                                    693.33333
                                       24.8
## 19
                             9875
                                                    398.18548
          2003-10-02
## 20
          1977-09-13
                             8614
                                       0.0
                                                          Inf
## 21
          1995-05-15
                             5551
                                       5.6
                                                    991.25000
                             2085
## 22
          2012-03-31
                                       0.1
                                                  20850.00000
## 23
                             780
                                       2.6
                                                    300.00000
          2006-05-19
## 24
                             0
                                       NA
                                                     NA
              <NA>
## 25
                            28043
                                       5.2
                                                   5392.88462
          2010-11-07
## 26
          2001-08-29
                            2536
                                      8.9
                                                   284.94382
## 27
                            10182
                                      0.0
                <NA>
                                                          Inf
```

## 29	##			10710	00 5	
## 30						223.11864
## 31						Inf
## 32						211.75473
## 33						671.56398
## 34						Inf
## 35	##					349.29775
## 36	##	34 1995	5-10-18	52935	142.0	372.78169
## 37	##	35 1985	5-12-13	10064	6.6	1524.84848
## 38	##	36 1990)-09-30	2254	9.5	237.26316
## 39	##	37 2001	1-11-21	7460	5.1	1462.74510
## 40	##	38 2013	3-03-02	897	0.0	Inf
## 41	##	39 2012	2-04-10	578	0.0	Inf
## 42	##	40 2013	3-05-20	263	0.0	Inf
## 43	##	41 1999	9-10-25	9484	22.7	417.79736
## 44	##	42	<na></na>	534	0.0	Inf
## 45	##	43 2005	5-11-03	24467	16.9	1447.75148
## 46	##	44 2004	1-09-26	13707	17.5	783.25714
## 47	##	45 1994	1-05-13	3923	1.3	3017.69231
## 48	##	46	<na></na>	402	0.0	Inf
## 49	##	47 2012	2-04-02	2173	0.1	21730.00000
## 50	##	48 2003	3-08-01	2182	3.3	661.21212
## 51	##	49 1993	3-01-01	324	0.4	810.00000
## 51	##				3.7	2160.54054
## 52	##					186.83453
## 53						583.84314
## 54						Inf
## 55						273.63218
## 56						Inf
## 57						Inf
## 58						184.08953
## 59						469.52128
## 60						459.08676
## 61						
## 62						Inf
## 63						
## 64						80.21739
## 65						Inf
## 66						Inf
## 67						
## 68						1379.41170 Inf
## 69						Inf
## 70 2007-08-21 8235 0.0 ## 71 1992-08-03 65475 185.8 352.39 ## 72 1979-11-24 65264 566.1 115.28 ## 73 1995-01-23 5719 36.5 156.68 ## 74 1994-09-24 6015 36.1 166.62 ## 75 2000-08-01 1984 9.9 200.40 ## 76 2001-07-15 2212 8.9 248.53 ## 77 2007-10-02 1034 0.3 3446.66 ## 78 1988-10-03 2406 3.9 616.92						Inf
## 71 1992-08-03 65475 185.8 352.39 ## 72 1979-11-24 65264 566.1 115.28 ## 73 1995-01-23 5719 36.5 156.68 ## 74 1994-09-24 6015 36.1 166.62 ## 75 2000-08-01 1984 9.9 200.40 ## 76 2001-07-15 2212 8.9 248.53 ## 77 2007-10-02 1034 0.3 3446.66 ## 78 1988-10-03 2406 3.9 616.92						Inf
## 72						
## 73						
## 74						
## 75 2000-08-01 1984 9.9 200.40 ## 76 2001-07-15 2212 8.9 248.53 ## 77 2007-10-02 1034 0.3 3446.66 ## 78 1988-10-03 2406 3.9 616.92						
## 76 2001-07-15 2212 8.9 248.53 ## 77 2007-10-02 1034 0.3 3446.66 ## 78 1988-10-03 2406 3.9 616.92						
## 77 2007-10-02 1034 0.3 3446.66 ## 78 1988-10-03 2406 3.9 616.92						200.40404
## 78 1988-10-03 2406 3.9 616.92						248.53933
						3446.66667
						616.92308
	##		3-06-28	3934	23.9	164.60251
	##					221.03261
## 81 1995-09-19 130620 227.8 573.39		U1 100E	5-09-19	130620	227.8	573.39772

```
## 83
           2002-11-28
                               4746
                                          3.3
                                                       1438.18182
## 84
           2009-07-08
                                         15.9
                              15203
                                                       956.16352
## 85
           1986-10-06
                                         72.2
                                                        203.60111
                              14700
## 86
           2005-11-08
                               5073
                                          5.0
                                                       1014.60000
## 87
           2002-05-31
                               2495
                                          1.3
                                                       1919.23077
## 88
                 <NA>
                               1484
                                          0.0
                                                              Inf
## 89
           1982-10-02
                                        105.9
                                                        580.84042
                              61511
## 90
           1998-12-22
                               7880
                                         15.0
                                                        525.33333
## 91
           2010-12-02
                                          1.5
                                                       5668.66667
                               8503
## 92
           1989-12-26
                              16660
                                         52.3
                                                        318.54685
## 93
                                                        77.29508
           1977-05-31
                                943
                                         12.2
## 94
           1997-01-28
                                         51.6
                                                        287.38372
                              14829
## 95
           2008-08-01
                                          7.4
                                                        263.10811
                               1947
## 96
           1999-04-21
                              22136
                                         22.4
                                                        988.21429
## 97
           2012-11-22
                                826
                                          0.0
                                                              Inf
## 98
           2009-09-10
                               3185
                                          4.6
                                                        692.39130
## 99
           2008-02-12
                               3044
                                          7.7
                                                        395.32468
## 100
           1996-02-27
                              23438
                                          7.9
                                                       2966.83544
## 101
           2009-01-05
                               1460
                                          0.3
                                                       4866.66667
#1)
oil_fields <- oil_fields %>%
  mutate(invest_per_rec = total.invest/recoverable_oil)
ggplot(oil_fields, mapping = aes(
  x = producing_from,
  y = invest_per_rec)
```

0.7

2956

4222.85714

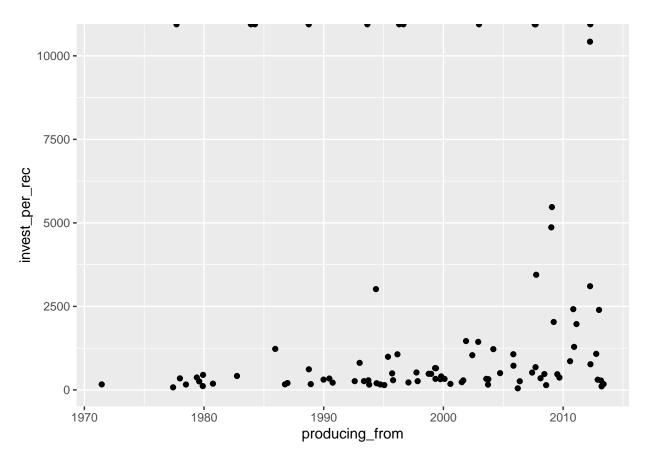
Warning: Removed 9 rows containing missing values (geom_point).

82

) +

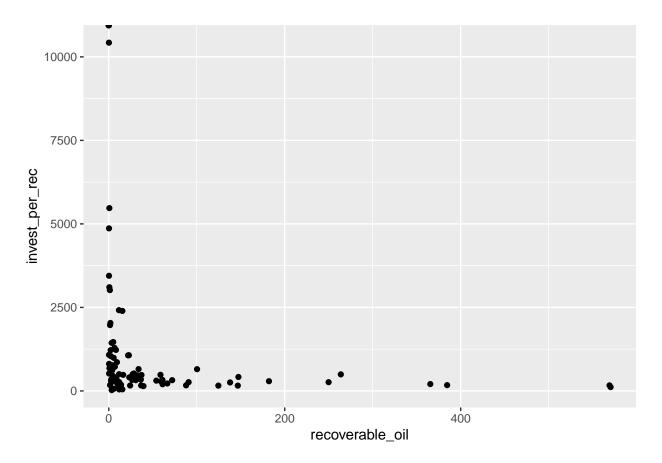
geom_point()

2011-02-12



```
ggplot(oil_fields, mapping = aes(
    x = recoverable_oil,
    y = invest_per_rec)
    ) +
    geom_point()
```

Warning: Removed 2 rows containing missing values (geom_point).



#2)

```
oil_fields_arranged <- oil_fields %>%
   arrange(by_group = invest_per_rec)
threshold <- oil_fields_arranged[5,]$invest_per_rec
threshold</pre>
```

[1] 67

```
oil_fields %>%
filter(invest_per_rec<= threshold)</pre>
```

```
##
     ...1
                   name
                              lon
                                       lat recoverable_oil remaining_oil
## 1 118
                  BØYLA 1.848627 59.32033
                                                       3.4
                                                                      3.4
## 2 146
               BRYNHILD 2.297317 57.49330
                                                       3.6
                                                                      3.6
## 3 752
                  KNARR 2.781421 61.80114
                                                       11.9
                                                                     11.9
## 4 802 MARTIN LINGE 2.054545 60.50824
                                                       6.0
                                                                      6.0
## 5 1081 RINGHORNE ØST 2.494802 59.29083
                                                       15.5
                                                                      6.3
     producing_from total.invest extracted invest_per_millsm3 invest_per_rec
## 1
               <NA>
                              85
                                        0.0
                                                                      25.00000
                                                            Inf
## 2
               <NA>
                              210
                                        0.0
                                                            Inf
                                                                      58.33333
                              534
## 3
               <NA>
                                        0.0
                                                            Inf
                                                                      44.87395
## 4
               <NA>
                              402
                                        0.0
                                                            Inf
                                                                      67.00000
## 5
                              738
                                                       80.21739
         2006-03-19
                                        9.2
                                                                      47.61290
```

##		1	name	lon	lat	recoverable_oil	remaining_oil
##	1	1	33/9-6 DELTA	NA	NA	NA	NA
##	2	6	ALBUSKJELL	2.993019	56.63079	7.4	0.0
##	3	46	ALVE	7.827906	65.96924	1.9	0.8
##	4	54	ALVHEIM	2.010224	59.57465	37.2	17.5
##	5	64	ÅSGARD	6.728537	65.11635	100.4	18.6
##	6	82	ATLA	2.577873	59.67057	0.3	0.3
##	7	85	BALDER		59.30631	72.1	16.2
##	8	109	BLANE		56.88505	0.8	0.3
##		118	BØYLA		59.32033	3.4	3.4
##		121	BRAGE		60.58058	59.3	4.0
##		146	BRYNHILD		57.49330	3.6	3.6
	12	149	COD		57.06647	2.9	0.0
##		190	DRAUGEN		64.33243	146.7	14.9
	14	216	EDDA		56.47110	4.8	0.0
	15	257	EKOFISK		56.54663	569.2	129.8
	16	301	ELDFISK		56.39870	137.9	37.3
	17	341	EMBLA		56.32710	11.9	1.5
	18	365	ENOCH		58.64759	0.4	0.1
	19	374	FRAM		61.01547	30.7	5.9
	20	391	FRIGG		59.91108	0.0	0.0
	21	428	FRØY		59.73203	5.6	0.0
	22	450	GAUPE		57.96129	0.2	0.1
	23	454	GIMLE		61.24770	3.0	0.4
	24	464	GINA KROG	NA 2 04F000	NA	NA	NA
	25	468	GJØA		61.33418	11.6	6.4
	26	485	GLITNE	22.296546	58.71153	8.9	0.0
	27 28	499 504				30.2 124.6	30.2 36.1
	29	504 520	GRANE GUDRUN		59.18574 58.84938	11.7	11.7
	30	524	GULLFAKS		61.20896	365.5	11.6
	31	524 557	GULLFAKS SØR		61.10673	58.8	16.6
##	32	575	GUNGNE		58.30961	0.0	0.0
##	33	594	GYDA		56.85435	36.5	0.9
##	34	620	HEIDRUN		65.32944	182.1	40.1
##	35	648	HEIMDAL		59.58547	8.2	1.6
	36	681	HOD		56.19843	10.4	0.9
##		707	HULDRA		60.85444	5.1	0.0
##		723	HYME		64.34594	3.2	3.2
##		726	ISLAY	NA	NA	0.0	0.0
##		730	JETTE		59.39335	1.5	1.5
##		733	JOTUN		59.42954	23.4	0.7
##		752	KNARR		61.80114	11.9	11.9
##		755	KRISTIN		64.97139	22.9	6.0
##	44	768	KVITEBJØRN		61.09226	27.3	9.8
##	45	782	LILLE-FRIGG		59.95617	1.3	0.0
##		802	MARTIN LINGE		60.50824	6.0	6.0
##	47	808	MARULK		65.95250	0.7	0.6
##	48	813	MIKKEL		64.68017	6.6	3.3
##	49	826	MIME		57.12693	0.4	0.0
##	50	832	MORVIN	6.460434	65.15322	9.3	5.6

	-4	000	MIDGHTGON	4 744470	64 40400	40.0	0.0
	51	839	MURCHISON		61.40133	13.9	0.0
##		879	NJORD	7.085968		28.5	3.0
##		898	NORDØST FRIGG		60.00514	0.0	0.0
	54	917	NORNE		66.03421	90.8	3.8
##	55	937	ODIN	2.172505	60.06075	0.0	0.0
##	56	960	ORMEN LANGE	5.349480	63.49258	0.0	0.0
##	57	971	OSEBERG	2.722425	60.54786	384.6	22.7
##	58	1002	OSEBERG ØST	2.978614	60.61807	26.7	7.9
##	59	1020	OSEBERG SØR	2.760004	60.25226	61.0	17.2
##	60	1039	OSELVAR	2.717955	56.93144	4.6	4.5
##	61	1044	ØST FRIGG	2.354428	59.91862	0.0	0.0
##	62	1068	REV	1.932832	58.02975	0.7	0.0
##	63	1081	RINGHORNE ØST	2.494802	59.29083	15.5	6.3
	64	1090	SIGYN		58.28605	0.0	0.0
	65	1104	SKARV	7.627655		15.5	15.5
	66	1116	SKIRNE		59.61747	2.2	0.5
##		1129	SKULD	8.314253		13.4	13.4
	68	1132	SLEIPNER ØST		58.43631	0.0	0.0
##		1159	SLEIPNER VEST		58.44112	0.0	0.0
##							
		1182		20.974280		0.0	0.0
##		1194	SNORRE		61.49258	249.9	64.1
##		1220	STATFJORD		61.26222	570.4	4.3
	73	1260	STATFJORD NORD		61.44457	39.5	3.0
	74	1284	STATFJORD ØST		61.33880	36.8	0.7
##		1308	SYGNA		61.47588	11.0	1.1
##		1323	TAMBAR	2.963593		9.5	0.6
##		1337	TAMBAR ØST		56.97172	0.3	0.0
	78		TOMMELITEN GAMMA		56.48807	3.9	0.0
	79	1369	TOR		56.64148	24.3	0.4
##		1409	TORDIS		61.28220	61.2	6.0
##		1432	TROLL		60.82293	263.8	36.0
##	82	1460	TRYM	4.236097	56.40414	1.5	0.8
##	83	1465	TUNE	2.653474	60.43847	3.3	0.0
##	84	1481	TYRIHANS	7.000546	64.79362	32.4	16.5
##	85	1491	ULA	2.860582	57.10273	87.9	15.7
##	86	1522	URD	8.181120	66.05629	7.0	2.0
##	87	1533	VALE	2.302589	59.70584	2.4	1.1
##	88	1549	VALEMON	2.355820	61.04258	4.9	4.9
##	89	1553	VALHALL	3.393803	56.27577	147.4	41.5
##	90	1590	VARG	1.908065	58.07247	16.4	1.4
##	91	1608	VEGA	3.353838	61.35584	6.6	5.1
##	92	1616	VESLEFRIKK	2.891658	60.78827	54.1	1.8
##	93	1643	VEST EKOFISK	3.085798	56.56262	12.2	0.0
##	94	1684		2.147171		66.6	15.0
	95	1704		2.275522		13.6	6.2
	96	1713		2.558184		33.9	
	97	1732	VISUND SØR			2.7	
	98	1735		1.946607		8.6	4.0
	99	1745		1.890830		8.7	1.0
		1754		4.362773		22.0	14.1
		1796	YTTERGRYTA			0.3	0.0
##	101		cing_from total.				
##	1	Produ	<na></na>	0	NA	NA	NA
##			1979-05-26	2752	7.4	371.89189	371.89189
и п	-	•	20.0 00 20	2.02		0,1.00100	0,1.00100

шш	0	0000 00 10	2004	4 4	2510 70707	0000 00404
##		2009-03-19	3864	1.1	3512.72727	2033.68421
	4	2008-06-08	17708	19.7	898.88325	476.02151
	5	1999-05-19	65301	81.8	798.30073	650.40837
	6	2012-10-07	324	0.0	Inf	1080.00000
	7	1999-10-02	23198	55.9	414.99106	321.74757
	8	2007-09-12	544	0.5	1088.00000	680.00000
	9	<na></na>	85	0.0	Inf	25.00000
	10	1993-09-23	17062	55.3	308.53526	287.72344
##	11	<na></na>	210	0.0	Inf	58.33333
##	12	1977-12-26	1003	2.9	345.86207	345.86207
##	13	1993-10-19	23291	131.8	176.71472	158.76619
##	14	1979-12-02	2157	4.8	449.37500	449.37500
##	15	1971-06-15	94172	439.4	214.31953	165.44624
##	16	1979-08-08	34963	100.6	347.54473	253.53880
##	17	1993-05-12	3129	10.4	300.86538	262.94118
##	18	2007-05-31	208	0.3	693.33333	520.00000
##	19	2003-10-02	9875	24.8	398.18548	321.66124
##	20	1977-09-13	8614	0.0	Inf	Inf
	21	1995-05-15	5551	5.6	991.25000	991.25000
	22	2012-03-31	2085	0.1	20850.00000	10425.00000
	23	2006-05-19	780	2.6	300.00000	260.00000
	24	<na></na>	0	NA	NA	NA
	25	2010-11-07	28043	5.2	5392.88462	2417.50000
	26	2001-08-29	2536	8.9	284.94382	284.94382
##	27	<na></na>	10182	0.0	Inf	337.15232
	28	2003-09-23	19746	88.5	223.11864	158.47512
	29	<na></na>	5857	0.0	Inf	500.59829
##	30	1986-12-22	74940	353.9	211.75473	205.03420
	31	1998-10-10	28340	42.2	671.56398	481.97279
##	32	1996-04-21	1930	0.0	Inf	Inf
##	33	1990-06-21	12435	35.6	349.29775	340.68493
##	34	1995-10-18	52935	142.0	372.78169	290.69193
##	35	1985-12-13	10064	6.6	1524.84848	1227.31707
##	36	1990-09-30	2254	9.5	237.26316	216.73077
	37	2001-11-21	7460	5.1	1462.74510	1462.74510
	38	2013-03-02	897	0.0	Inf	280.31250
##	39	2012-04-10	578	0.0	Inf	Inf
##	40	2013-05-20	263	0.0	Inf	175.33333
##	41	1999-10-25	9484	22.7	417.79736	405.29915
##		<na></na>	534	0.0	Inf	44.87395
##	43	2005-11-03	24467	16.9	1447.75148	1068.42795
##	44	2004-09-26	13707	17.5	783.25714	502.08791
##		1994-05-13	3923	1.3	3017.69231	3017.69231
##	46	<na></na>	402	0.0	Inf	67.00000
##	47	2012-04-02	2173	0.1	21730.00000	3104.28571
##	48	2003-08-01	2182	3.3	661.21212	330.60606
##	49	1993-01-01	324	0.4	810.00000	810.00000
##	50	2010-08-01	7994	3.7	2160.54054	859.56989
##	51	1980-09-28	2597	13.9	186.83453	186.83453
##	52	1997-09-30	14888	25.5	583.84314	522.38596
##	53	1983-12-01	1816	0.0	Inf	Inf
##	54	1997-11-06	23806	87.0	273.63218	262.18062
##	55	1984-04-01	2614	0.0	Inf	Inf
##	56	2007-09-13	35967	0.0	Inf	Inf

```
## 58
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                                 8827
                                            18.8
                                                           469.52128
                                                                            330.59925
## 59
            2000-02-05
                                20108
                                            43.8
                                                           459.08676
                                                                            329.63934
## 60
                                             0.1
                                                         35350.00000
                                                                            768.47826
            2012-04-14
                                 3535
## 61
            1988-10-01
                                 2186
                                             0.0
                                                                  Inf
                                                                                  Inf
## 62
            2009-01-24
                                 3831
                                             0.7
                                                          5472.85714
                                                                          5472.85714
## 63
            2006-03-19
                                  738
                                             9.2
                                                            80.21739
                                                                             47.61290
                                             0.0
## 64
            2002-12-22
                                 2066
                                                                  Inf
                                                                                  Inf
## 65
            2013-01-01
                                37119
                                             0.0
                                                                           2394.77419
                                                                  Tnf
## 66
            2004-03-03
                                 2685
                                             1.7
                                                          1579.41176
                                                                          1220.45455
## 67
            2013-03-19
                                 1434
                                             0.0
                                                                  Inf
                                                                            107.01493
## 68
            1993-08-24
                                26756
                                             0.0
                                                                  Inf
                                                                                  Inf
                                             0.0
## 69
            1996-08-29
                                                                  Inf
                                                                                  Inf
                                23176
## 70
            2007-08-21
                                 8235
                                             0.0
                                                                  Inf
                                                                                  Inf
## 71
                                           185.8
                                                           352.39505
            1992-08-03
                                65475
                                                                            262.00480
## 72
            1979-11-24
                                65264
                                           566.1
                                                           115.28705
                                                                            114.41795
## 73
                                            36.5
            1995-01-23
                                 5719
                                                           156.68493
                                                                            144.78481
## 74
            1994-09-24
                                            36.1
                                                           166.62050
                                                                            163.45109
                                 6015
## 75
                                             9.9
            2000-08-01
                                 1984
                                                           200.40404
                                                                            180.36364
## 76
            2001-07-15
                                 2212
                                             8.9
                                                           248.53933
                                                                            232.84211
## 77
            2007-10-02
                                 1034
                                             0.3
                                                          3446.66667
                                                                          3446.66667
## 78
                                                           616.92308
                                                                            616.92308
            1988-10-03
                                 2406
                                             3.9
## 79
                                            23.9
            1978-06-28
                                                           164.60251
                                                                            161.89300
                                 3934
## 80
            1994-06-03
                                12201
                                           55.2
                                                           221.03261
                                                                            199.36275
## 81
            1995-09-19
                              130620
                                           227.8
                                                           573.39772
                                                                            495.14784
## 82
            2011-02-12
                                 2956
                                             0.7
                                                          4222.85714
                                                                          1970.66667
## 83
            2002-11-28
                                 4746
                                             3.3
                                                          1438.18182
                                                                          1438.18182
## 84
            2009-07-08
                                15203
                                            15.9
                                                           956.16352
                                                                            469.22840
## 85
                                           72.2
            1986-10-06
                                14700
                                                           203.60111
                                                                            167.23549
            2005-11-08
## 86
                                 5073
                                             5.0
                                                          1014.60000
                                                                           724.71429
## 87
            2002-05-31
                                 2495
                                             1.3
                                                          1919.23077
                                                                           1039.58333
## 88
                   <NA>
                                 1484
                                             0.0
                                                                            302.85714
                                                                  Inf
## 89
            1982-10-02
                                61511
                                           105.9
                                                           580.84042
                                                                            417.30665
## 90
            1998-12-22
                                 7880
                                           15.0
                                                           525.33333
                                                                            480.48780
## 91
            2010-12-02
                                 8503
                                                          5668.66667
                                                                           1288.33333
                                             1.5
## 92
            1989-12-26
                                16660
                                           52.3
                                                           318.54685
                                                                            307.94824
## 93
            1977-05-31
                                  943
                                            12.2
                                                            77.29508
                                                                            77.29508
## 94
            1997-01-28
                                            51.6
                                                           287.38372
                                                                            222.65766
                                14829
## 95
            2008-08-01
                                            7.4
                                 1947
                                                           263.10811
                                                                            143.16176
## 96
            1999-04-21
                                22136
                                            22.4
                                                           988.21429
                                                                            652.97935
## 97
            2012-11-22
                                  826
                                             0.0
                                                                  Inf
                                                                            305.92593
## 98
            2009-09-10
                                                           692.39130
                                 3185
                                             4.6
                                                                            370.34884
## 99
            2008-02-12
                                 3044
                                             7.7
                                                           395.32468
                                                                            349.88506
## 100
            1996-02-27
                                             7.9
                                                                           1065.36364
                                23438
                                                          2966.83544
## 101
            2009-01-05
                                 1460
                                             0.3
                                                          4866.66667
                                                                          4866.66667
oil_fields_reg <- oil_fields %>%
  filter(!is.na(invest_per_millsm3)) %>%
  filter(!is.na(lat)) %>%
  filter(invest_per_millsm3 != Inf)
oil fields reg
```

57

1988-12-01

66622

361.9

184.08953

173.22413

```
## ...1 name lon lat recoverable_oil remaining_oil
## 1 6 ALBUSKJELL 2.993019 56.63079 7.4 0.0
```

	_						
##		46		7.827906		1.9	0.8
##		54		2.010224		37.2	17.5
##		64		6.728537		100.4	18.6
##		85		2.446895		72.1	16.2
##		109		2.473427		0.8	0.3
##		121		3.014216		59.3	4.0
##		149		2.422911		2.9	0.0
##		190		7.756043		146.7	14.9
##		216		3.103594		4.8	0.0
	11	257		3.218287		569.2	129.8
	12	301		3.242870		137.9	37.3
	13	341		3.249919		11.9	1.5
	14	365		1.523260		0.4	0.1
	15	374		3.528545		30.7	5.9
	16	428		2.556764		5.6	0.0
	17	450		1.931471		0.2	0.1
	18	454		2.317010		3.0	0.4
	19	468	•	3.945822		11.6	6.4
##		485		1.647140		8.9	0.0
##		504		2.506074		124.6	36.1
	22	524		2.130364		365.5	11.6
	23	557	GULLFAKS SØR			58.8	16.6
	24	594		3.089733		36.5	0.9
##		620		7.306980		182.1	40.1
##		648		2.226203		8.2	1.6
	27	681		3.472108		10.4	0.9
##		707		2.641797		5.1	0.0
##		733		2.325348		23.4	0.7
##		755		6.433011		22.9	6.0
##		768	KVITEBJØRN			27.3	9.8
	32	782	LILLE-FRIGG			1.3	0.0
##		808		7.586522		0.7	0.6
##		813		7.669056		6.6	3.3
	35	826		2.494998		0.4	0.0
	36	832		6.460434		9.3	5.6
##	37	839	MURCHISON			13.9	0.0
##		879		7.085968		28.5	3.0
	39	917		8.147307		90.8	3.8
	40	971		2.722425		384.6	22.7
		1002	OSEBERG ØST			26.7	7.9
		1020	OSEBERG SØR			61.0	17.2
		1039		2.717955		4.6	4.5
		1068		1.932832		0.7	0.0
		1081	RINGHORNE ØST			15.5	6.3
		1116		2.491161		2.2	0.5
		1194		2.193464		249.9	64.1
		1220	STATEJORD			570.4	4.3
		1260	STATFJORD NORD			39.5	3.0
		1284	STATFJORD ØST			36.8	0.7
		1308		2.003040		11.0	1.1
		1323		2.963593		9.5	0.6
		1337	TAMBAR ØST			0.3	0.0
			TOMMELITEN GAMMA			3.9	0.0
##	55	1369	TOR	3.329413	56.64148	24.3	0.4

		1409	TORDIS 2.1179			6.0
		1432	TROLL 3.5520			36.0
		1460	TRYM 4.2360			0.8
		1465	TUNE 2.6534			0.0
			YRIHANS 7.0005			16.5
		1491		82 57.10273		15.7
		1522	URD 8.1811			2.0
		1533	VALE 2.3025			1.1
			VALHALL 3.3938			41.5
		1590	VARG 1.9080			1.4
		1608	VEGA 3.3538			5.1
			LEFRIKK 2.8916			1.8
			EKOFISK 3.0857			0.0
		1684	VIGDIS 2.1471			15.0
		1704	VILJE 2.2755			6.2
		1713	VISUND 2.5581			11.5
	. –	1735	VOLUND 1.9466			4.0
		1745	VOLVE 1.8908			1.0
		1754		73 57.74885		14.1
##	75		ERGRYTA 7.5150			0.0
##					invest_per_millsm3	- - -
##	_	1979-05-26	2752	7.4	371.89189	371.89189
##	_	2009-03-19	3864	1.1	3512.72727	2033.68421
##		2008-06-08		19.7	898.88325	476.02151
##		1999-05-19	65301	81.8	798.30073	650.40837
##		1999-10-02		55.9	414.99106	321.74757
##		2007-09-12		0.5	1088.00000	680.00000
##		1993-09-23	17062	55.3	308.53526	287.72344
##		1977-12-26	1003	2.9	345.86207	345.86207
##		1993-10-19	23291	131.8	176.71472	158.76619
	10	1979-12-02		4.8	449.37500	449.37500
	11	1971-06-15	94172	439.4	214.31953	
	12					165.44624
		1979-08-08	34963	100.6	347.54473	253.53880
##	13	1993-05-12	3129	10.4	347.54473 300.86538	253.53880 262.94118
	14	1993-05-12 2007-05-31	3129 208	10.4 0.3	347.54473 300.86538 693.33333	253.53880 262.94118 520.00000
##	14 15	1993-05-12 2007-05-31 2003-10-02	3129 208 9875	10.4 0.3 24.8	347.54473 300.86538 693.33333 398.18548	253.53880 262.94118 520.00000 321.66124
## ##	14 15 16	1993-05-12 2007-05-31 2003-10-02 1995-05-15	3129 208 9875 5551	10.4 0.3 24.8 5.6	347.54473 300.86538 693.33333 398.18548 991.25000	253.53880 262.94118 520.00000 321.66124 991.25000
## ## ##	14 15 16 17	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31	3129 208 9875 5551 2085	10.4 0.3 24.8 5.6 0.1	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000
## ## ## ##	14 15 16 17 18	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19	3129 208 9875 5551 2085 780	10.4 0.3 24.8 5.6 0.1 2.6	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000
## ## ## ##	14 15 16 17 18 19	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07	3129 208 9875 5551 2085 780 28043	10.4 0.3 24.8 5.6 0.1 2.6 5.2	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000
## ## ## ## ##	14 15 16 17 18 19	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29	3129 208 9875 5551 2085 780 28043 2536	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9	347.54473 300.86538 693.3333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382
## ## ## ## ##	14 15 16 17 18 19 20 21	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23	3129 208 9875 5551 2085 780 28043 2536 19746	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512
## ## ## ## ## ##	14 15 16 17 18 19 20 21 22	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22	3129 208 9875 5551 2085 780 28043 2536 19746 74940	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420
## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279
## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493
## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193
## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6	347.54473 300.86538 693.3333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707
## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5	347.54473 300.86538 693.3333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077
## ## ## ## ## ## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30 2001-11-21	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254 7460	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5 5.1	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316 1462.74510	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077 1462.74510
## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30 2001-11-21 1999-10-25	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254 7460 9484	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5 5.1 22.7	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316 1462.74510 417.79736	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077 1462.74510 405.29915
## ## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30 2001-11-21 1999-10-25 2005-11-03	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254 7460 9484 24467	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5 5.1 22.7 16.9	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316 1462.74510 417.79736 1447.75148	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077 1462.74510 405.29915 1068.42795
## ## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30 2001-11-21 1999-10-25 2005-11-03 2004-09-26	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254 7460 9484 24467 13707	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5 5.1 22.7 16.9 17.5	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316 1462.74510 417.79736 1447.75148 783.25714	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077 1462.74510 405.29915 1068.42795 502.08791
## ## ## ## ## ## ## ## ## ##	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1993-05-12 2007-05-31 2003-10-02 1995-05-15 2012-03-31 2006-05-19 2010-11-07 2001-08-29 2003-09-23 1986-12-22 1998-10-10 1990-06-21 1995-10-18 1985-12-13 1990-09-30 2001-11-21 1999-10-25 2005-11-03	3129 208 9875 5551 2085 780 28043 2536 19746 74940 28340 12435 52935 10064 2254 7460 9484 24467 13707 3923	10.4 0.3 24.8 5.6 0.1 2.6 5.2 8.9 88.5 353.9 42.2 35.6 142.0 6.6 9.5 5.1 22.7 16.9	347.54473 300.86538 693.33333 398.18548 991.25000 20850.00000 300.00000 5392.88462 284.94382 223.11864 211.75473 671.56398 349.29775 372.78169 1524.84848 237.26316 1462.74510 417.79736 1447.75148	253.53880 262.94118 520.00000 321.66124 991.25000 10425.00000 260.00000 2417.50000 284.94382 158.47512 205.03420 481.97279 340.68493 290.69193 1227.31707 216.73077 1462.74510 405.29915 1068.42795

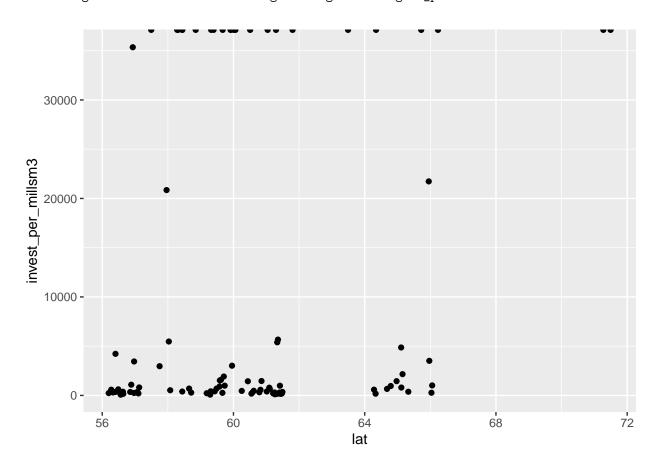
```
## 34
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                                            3.3
                                                          661.21212
                                                                          330.60606
## 35
                                                                          810.00000
           1993-01-01
                                324
                                            0.4
                                                          810.00000
           2010-08-01
                                                         2160.54054
## 36
                               7994
                                           3.7
                                                                          859.56989
## 37
           1980-09-28
                               2597
                                          13.9
                                                          186.83453
                                                                          186.83453
##
  38
           1997-09-30
                              14888
                                          25.5
                                                          583.84314
                                                                          522.38596
## 39
           1997-11-06
                              23806
                                          87.0
                                                          273.63218
                                                                          262.18062
## 40
           1988-12-01
                              66622
                                         361.9
                                                          184.08953
                                                                          173.22413
## 41
           1999-05-03
                               8827
                                          18.8
                                                          469.52128
                                                                          330.59925
## 42
           2000-02-05
                              20108
                                          43.8
                                                          459.08676
                                                                          329.63934
## 43
           2012-04-14
                               3535
                                           0.1
                                                       35350.00000
                                                                          768.47826
## 44
           2009-01-24
                               3831
                                           0.7
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                                            9.2
## 45
           2006-03-19
                                738
                                                           80.21739
                                                                           47.61290
## 46
           2004-03-03
                               2685
                                                                         1220.45455
                                            1.7
                                                         1579.41176
## 47
           1992-08-03
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                                         185.8
                                                          352.39505
                                                                          262.00480
## 48
                              65264
           1979-11-24
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           1995-01-23
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## 53
           2007-10-02
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                                                                         3446.66667
                                                                          616.92308
## 54
           1988-10-03
                               2406
                                           3.9
                                                          616.92308
## 55
           1978-06-28
                               3934
                                          23.9
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                                                          164.60251
## 56
           1994-06-03
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           1995-09-19
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## 57
                             130620
                                                          573.39772
                                                                          495.14784
## 58
           2011-02-12
                               2956
                                           0.7
                                                         4222.85714
                                                                         1970.66667
## 59
           2002-11-28
                               4746
                                           3.3
                                                         1438.18182
                                                                         1438.18182
## 60
           2009-07-08
                                                          956.16352
                              15203
                                          15.9
                                                                          469.22840
## 61
           1986-10-06
                              14700
                                          72.2
                                                          203.60111
                                                                          167.23549
## 62
           2005-11-08
                               5073
                                           5.0
                                                         1014.60000
                                                                          724.71429
## 63
           2002-05-31
                               2495
                                                         1919.23077
                                                                         1039.58333
                                            1.3
## 64
           1982-10-02
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                                         105.9
                                                          580.84042
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## 65
           1998-12-22
                               7880
                                          15.0
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                                                                          480.48780
## 66
           2010-12-02
                               8503
                                           1.5
                                                         5668.66667
                                                                         1288.33333
## 67
           1989-12-26
                              16660
                                          52.3
                                                          318.54685
                                                                          307.94824
##
  68
           1977-05-31
                                          12.2
                                                           77.29508
                                                                           77.29508
                                943
## 69
           1997-01-28
                              14829
                                          51.6
                                                          287.38372
                                                                          222.65766
## 70
           2008-08-01
                               1947
                                           7.4
                                                          263.10811
                                                                          143.16176
## 71
                                          22.4
                                                                          652.97935
           1999-04-21
                              22136
                                                          988.21429
## 72
           2009-09-10
                               3185
                                            4.6
                                                          692.39130
                                                                          370.34884
## 73
           2008-02-12
                               3044
                                           7.7
                                                          395.32468
                                                                          349.88506
                                                                         1065.36364
## 74
           1996-02-27
                              23438
                                           7.9
                                                         2966.83544
## 75
           2009-01-05
                               1460
                                           0.3
                                                         4866.66667
                                                                         4866.66667
```

Northmodel <- lm(invest_per_millsm3 ~ lat, data = oil_fields_reg)
summary(Northmodel)</pre>

```
##
## Call:
  lm(formula = invest_per_millsm3 ~ lat, data = oil_fields_reg)
##
## Residuals:
##
      Min
              1Q Median
                             ЗQ
                                    Max
           -1760 -1561
##
    -1983
                           -781
                                 33293
##
```

```
## Coefficients:
##
               Estimate Std. Error t value Pr(>|t|)
                                    0.193
## (Intercept) 2475.541 12794.064
                 -7.348
                           212.397 -0.035
                                              0.972
## lat
## Residual standard error: 5306 on 73 degrees of freedom
## Multiple R-squared: 1.639e-05, Adjusted R-squared: -0.01368
## F-statistic: 0.001197 on 1 and 73 DF, p-value: 0.9725
ggplot(data = oil_fields,
      mapping = aes(
        x = lat,
        y = invest_per_millsm3
      )) +
 geom_point()
```

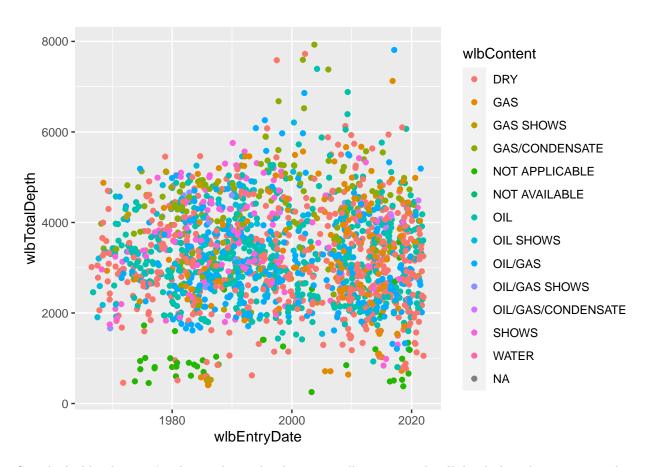
Warning: Removed 3 rows containing missing values (geom_point).



I don't think this hypothesis has much merit, latitude is not significantly correlated with invest_per_millsm3 and there isn't a clear relationship in the graph.

```
## Delimiter: ","
## chr (53): wlbWellboreName, wlbWell, wlbDrillingOperator, wlbProductionLicenc...
## dbl (33): wlbBottomHoleTemperature, wlbMaxInclation, wlbKellyBushElevation, ...
## lgl (1): wlbNamePart6
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show col types = FALSE' to quiet this message.
p_load(lubridate)
wellbores <- welbore
view(wellbores)
# Changing date variables to be in Date format
wellbores$wlbCompletionDate = dmy(wellbores$wlbCompletionDate)
wellbores$wlbEntryDate = dmy(wellbores$wlbEntryDate)
wellbores$wlbReleasedDate = dmy(wellbores$wlbReleasedDate)
wellbores$wlbPluggedDate = dmy(wellbores$wlbPluggedDate)
wellbores$wlbPluggedAbandonDate = dmy(wellbores$wlbPluggedAbandonDate)
wellbores$datesyncNPD = dmy(wellbores$datesyncNPD)
wellbores$wlbDateReclass = dmy(wellbores$wlbDateReclass)
wellbores$wlbDateUpdated = dmy(wellbores$wlbDateUpdated)
wellbores$wlbDateUpdatedMax = dmy(wellbores$wlbDateUpdatedMax)
ggplot(data = wellbores,
      mapping = aes(
        x = wlbEntryDate, y = wlbTotalDepth, color = wlbContent
      )) +
 geom_point()
```

Warning: Removed 42 rows containing missing values (geom_point).



So it looks like there isn't a huge relationship between well content and well depth, but there is a something worth investigating for well depth and time. There seems to be a higher concentration of gas wells after 2010, which is exactly what I expected (shale revolution). Interesting to see the little bunch of orange right after 1980, I wonder what was going on in the world then!