

# Cost of Capital for Norwegian Mobile Operators

Oslo, 21. February 2013

Professor Thore Johnsen, NHH

# Outline

- ◆ Summary
- ◆ Cost of Capital and WACC
- ◆ Calculation for a Norwegian Mobile operator
  
- ◆ Main WACC-parameters
  - Risk free rate
  - Market premium
  - Credit Risk premium
  - Asset Beta

## Summary for Norwegian Mobile Operators

- ◆ Update of my analysis from 2009
  - ◆ Risk free rate 4.5 % = 2.0 % real + 2.5 % inflation, reduced from 5,0 % / lower expected normal real rate
  - ◆ Asset beta 0.90, reduced from 1.15 / continued fall in beta estimates for European telecom / crisis effect or a normalization of the industry?
  - ◆ Market Risk Premium 4.5 %, increased from 4.0 %
  - ◆ Credit Risk Premium 1.5 % with 20 % leverage, decreased from 2.0 %
- ⇒ **Pre-tax WACC = 11.8 %**, down from **13.3 %**  
*Or 12.0 % vs 13.5 % when rounded*

- ◆ The estimated WACC represents the long run, 'normal' Cost of Capital for Norwegian mobile termination business
  - Does not reflect the still low crisis levels of government interest rates
  - nor the elevated levels of market and credit risk premiums (?)
  
- ◆ This WACC is significantly higher than that calculated by other Nordic and UK regulators
  - I use a higher long-run normal risk free rate, and
  - I use a higher asset beta, arguing that the fall in estimated asset betas partly reflects a temporary crisis effect (increased index risk due to more correlated individual stocks) and may thus be ignored in the WACC

- ◆ The estimated WACC is relevant for Norwegian MNOs (Telenor, Netcom, Tele2) and MVNOs
  - The business risk of MNOs may be higher due to higher operating leverage (fixed infrastructure costs) but this is probably countered by a likely better operating risk control
  
- ◆ This is a long run WACC which ignores any temporary higher capital cost in a build-up period and which assumes a professionally diversified final owner (the customers should not pay for any added cost caused by an imperfect ownership and funding model)

# Weighted Average Cost of Capital - WACC

$[D + E] \cdot \mathbf{WACC}$	Enterprise Value	Equity	$E \cdot \mathbf{k}_e$
		Debt	$D \cdot (1-t)R_d$

$$\mathbf{WACC} = \left[ \frac{E}{E + D} \right] \cdot (R_f + \beta_E \cdot \mathbf{MP}) + \left[ \frac{D}{E + D} \right] \cdot (1-t)R_D$$

$$\Rightarrow \mathbf{WACC} = R_f + \beta_A \cdot \mathbf{MP} + \mathbf{Debt}$$

$$\mathbf{Debt} = \left[ \frac{D}{E + D} \right] \cdot [(1-t)R_D - R_f]$$

- ◆ Before corporate tax (effective tax =  $t = 28\%$ )

$$\mathbf{WACC}^{\text{bt}} = \mathbf{WACC} / (1 - t) = R_f / (1-t) + \beta_A \cdot \mathbf{MP} / (1-t) + \mathbf{Debt} / (1-t)$$

## WACC calculation per 2012/13

$$WACC = R_f + \beta_A \cdot MP + Debt$$

$$4.5 \% + 0.90 \cdot 4.5 \% - 0.04 = \underline{8.5 \%}$$

$$Debt = (0.20) \cdot [0.72 \cdot (4.5\% + 1.5\%) - 4.5\%] \approx 0$$

- ◆ Before 28 % corporate tax

$$WACC^{bt} = 8.5 \% / (1 - 0.28) = \underline{11.8 \%}$$

$$= R_f / (1-t) + \beta_A \cdot MP / (1-t) + Debt / (1-t)$$

$$= 6.3 \% + 0.90 \cdot 6.3 \% - 0.05 \% = \underline{11.8 \%}$$

$$5.6 \%$$

# Comparison of WACC-estimates

## ◆ Before tax WACC

	2004	2005	2009	2012
Risk free	5,56	6,94	6,94	6,25
Risk premium	7,22	6,94	6,39	5,63
Debt				-0,05
<b>WACC</b>	<b>12,8</b>	<b>13,9</b>	<b>13,3</b>	<b>11,8</b>
<i>real</i>	<i>11,1</i>	<i>11,1</i>	<i>10,6</i>	<i>9,1</i>

### Parameter values

<b>Treasury rate</b>	<b>4,00</b>	<b>5,00</b>	<b>5,00</b>	<b>4,50</b>
<i>Inflation</i>	<i>1,50</i>	<i>2,50</i>	<i>2,50</i>	<i>2,50</i>
<b>Market premiur</b>	<b>4,00</b>	<b>4,00</b>	<b>4,00</b>	<b>4,50</b>
<b>Asset beta</b>	<b>1,30</b>	<b>1,25</b>	<b>1,15</b>	<b>0,90</b>
Leverage				0,20
<i>Equity beta</i>	<i>1,30</i>	<i>1,25</i>	<i>1,15</i>	<i>1,13</i>
Credit premium			2,00	1,50
Corp. Tax		0,28		



# International WACC-estimates – Before tax

- ◆ UK: - 2.9% = - 1.0% RF / - 1.9% RP
- ◆ Sweden: - 2.4% = - 1.3% RF / - 1.3% RP

	Norge		UK <sup>1</sup>	Sverige <sup>2</sup>	Danmark <sup>3</sup>
	2009	2012	2011	2011	2012
<b><u>Før skatt:</u></b>					
Risikofri rente	6,9	6,3	5,3	5,0	3,2
Risikopremie	6,4	5,6	3,7	4,3	3,1
Lånekost		-0,05	0,07	0,04	
<b>VAK før skatt</b>	<b>13,3</b>	<b>11,8</b>	<b>9,0</b>	<b>9,4</b>	<b>6,3</b>
reell	10,6	9,1	6,4	7,3	4,4

## Parameter values:

<b>Risk free rate</b>	<b>5,00</b>	<b>4,50</b>	<b>4,00</b>	<b>3,71</b>	<b>2,40</b>
<i>Inflation</i>		2,50	2,50	2,00	1,80
<b>Market premium</b>	<b>4,00</b>	<b>4,50</b>	<b>5,00</b>	<b>5,00</b>	<b>3,85</b>
<b>Asset beta</b>	<b>1,15</b>	<b>0,90</b>	<b>0,56</b>	<b>0,64</b>	<b>0,60</b>
Leverage	0	0,20	0,30	0,25	0
<i>Equity beta</i>	1,15	1,13	0,80	0,85	0,60
Credit premium		1,50	1,50	1,50	
Corporate tax		0,28	0,24	0,26	0,25

<sup>1</sup> Wholesale mobile voice call termination; Statement; Ofcom statement, 22. mar 2011.

<sup>2</sup> Synpunkter på förslaget till mobilkalkylränta; PTS 9. februar 2011.

<sup>3</sup> Afgørelse om maksimal pris for terminering i TDC's mobilnet; Erhvervsstyrelsen 17. juli 2012.

# Outline

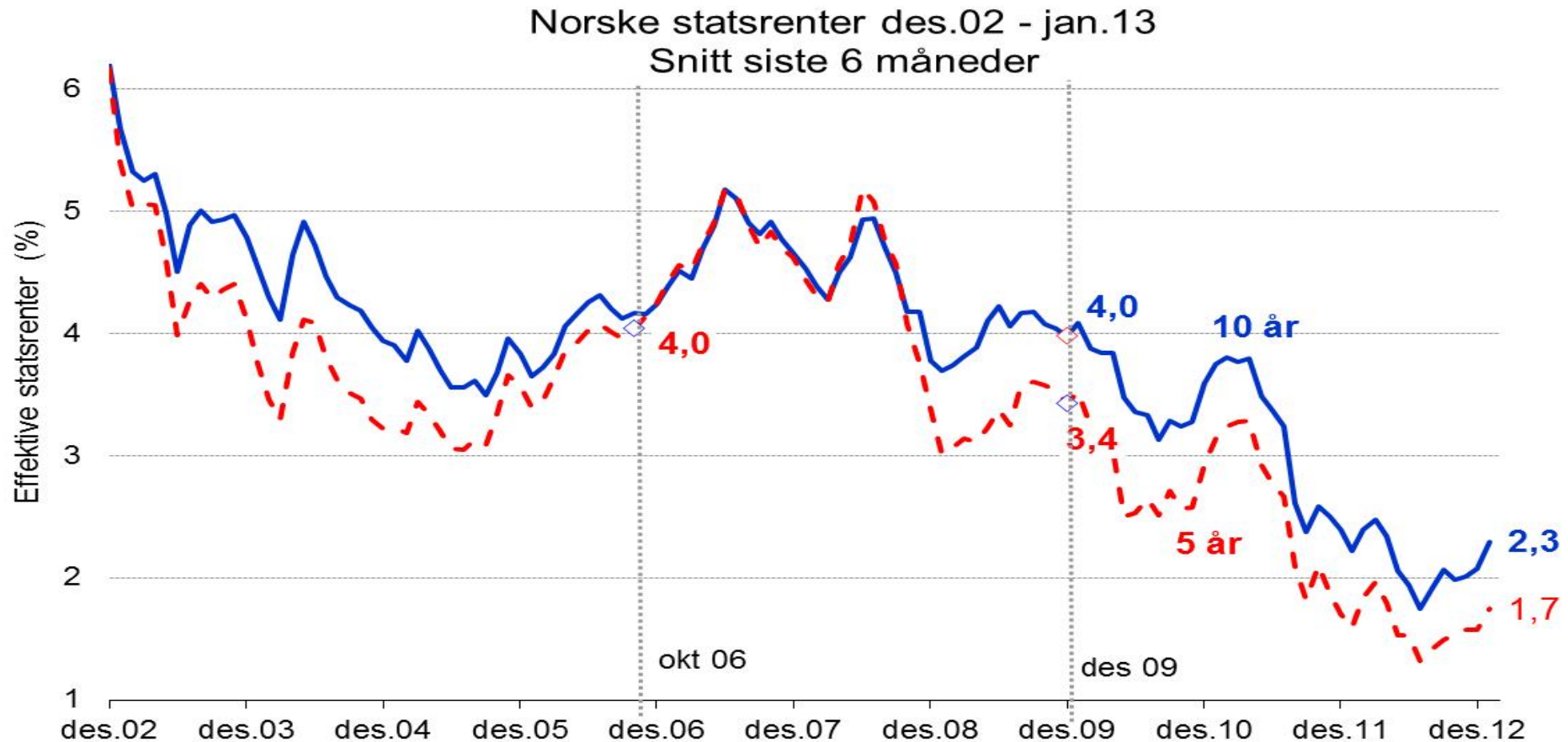
- ◆ Summary
- ◆ Cost of Capital and WACC
- ◆ Calculation for a Norwegian Mobile operator
  
- ◆ **Main WACC-parameters**
  - Risk free rate
  - Market premium
  - Credit Risk premium
  - Asset Beta

## Basic principles

- ◆ Market derived parameters for same / "similar" firm
- ◆ Compensate for cost of capital given professional funding and ownership (mimic competitive firms)
- ⇒ Customers should not pay for extra cost of
  - non-diversified owners
  - illiquid or non-listed shares
  - small size
- ◆ Predictable and stable WACC
  - 3-year regulation period
  - long-run, irreversible investments

# Norwegian government rates Des 02 – Jan 13

- ◆ Use a long term, 'normal' rate of **4.5 %** = 2.0 % real rate + 2.5 % inflation. Lowered real rate from 2.5 %.
- ◆ Maintained low crisis level of government rates



## Market Risk Premium (Equity Premium)

- ◆ Use a long term expected premium of 4.5 % (arithmetic), increased from 4.0 %.
- ◆ Midpoint of the range 3 % - 6 %.
- ◆ Required premium for a professional, internationally diversified investor.
- ◆ Broad support from academic and applied research, e.g. Dimson, Marsh & Staunton (Yearbook, Feb 12), Bradford DeLong & Magin (*J. of Ec. Perspectives*, Mar 09).

# Credit Risk Premium

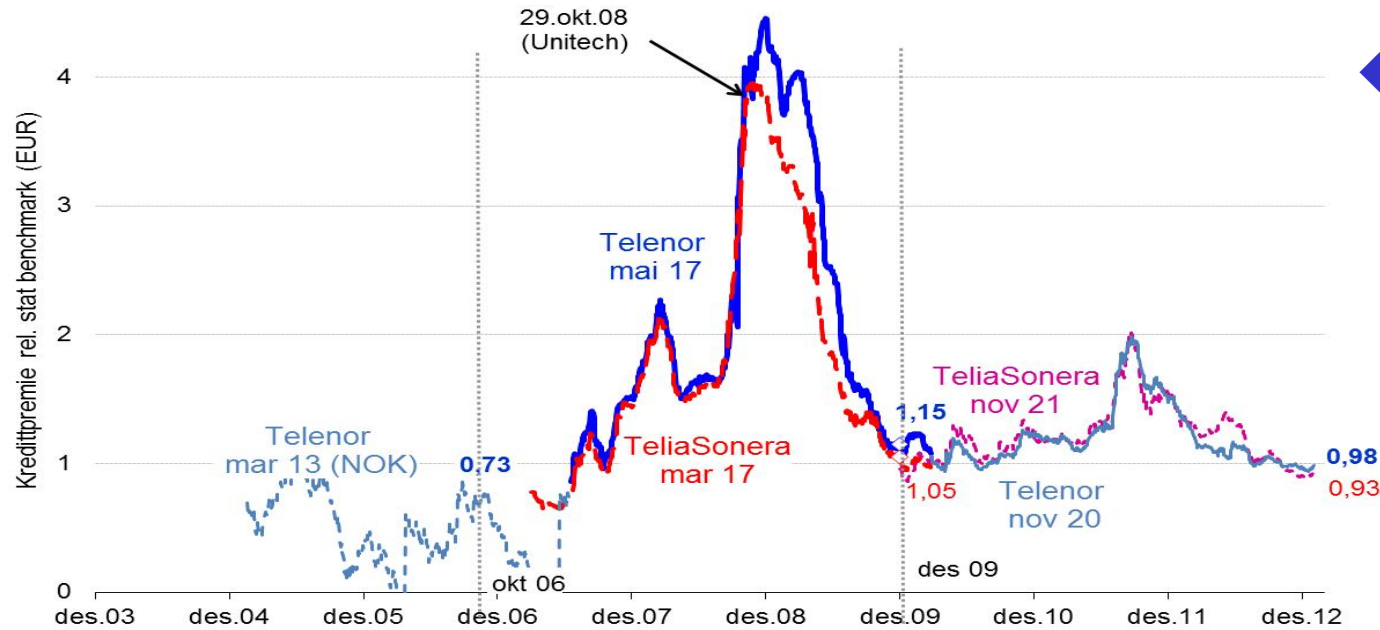
- ◆ Use a long-term, 'normal' credit premium of 1.5 % for a (stand-alone) mobile operator, down from 2.0 % in 2009
- ◆ Reflects 20 % leverage and a mid-quality credit risk (BBB)
- ◆ The current market credit spreads are approx. 1.0 % for Telenor and TeliaSonera, which have A- rating
- ◆ Differences in credit spreads & normal leverage are anyway ignorable in the WACC-calculation

## Credit premium in the pre-tax WACC

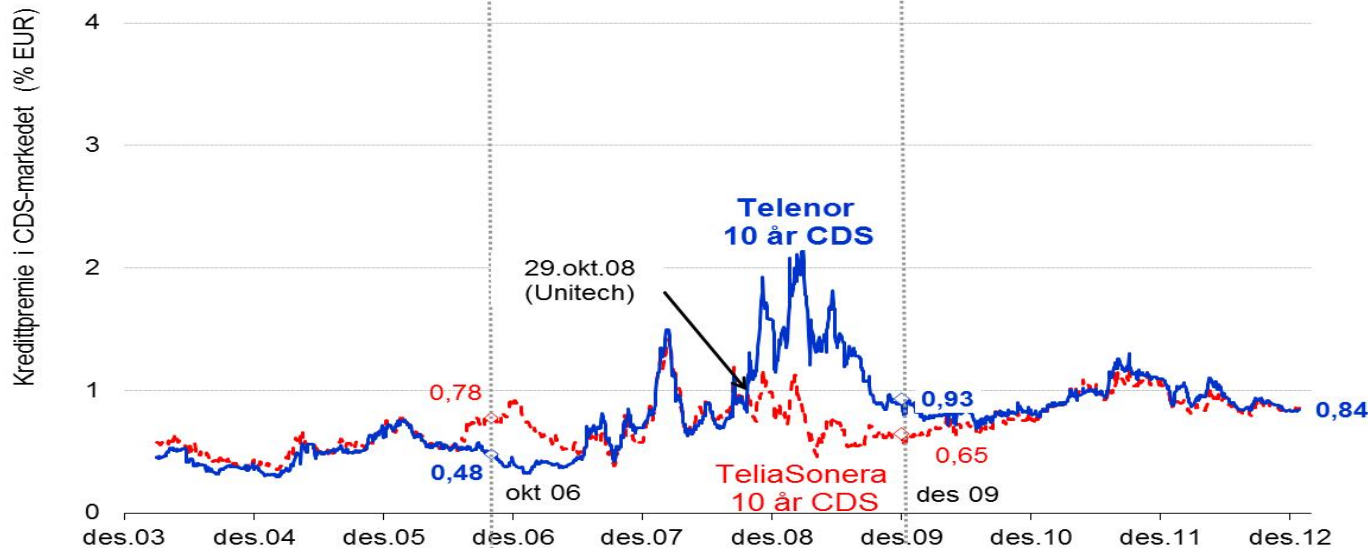
Risk Free	4,5 %		
Credit premium	Leverage		
	0,10	0,20	0,30
1,00 %	-0,08 %	-0,15 %	-0,23 %
1,5 %	-0,03 %	<b>-0,05 %</b>	-0,08 %
2,00 %	0,03 %	0,05 %	0,08 %

$$Debt = \left[ \frac{D}{E + D} \right] \cdot [R_D - R_f / (1-t)]$$

# Credit Premiums for Telenor and TeliaSonera des.03 – jan.13



- ◆ Spreads for 10 yrs bonds rel. to gov. benchmark rates (Euro).



- ◆ Credit Default Swap rates for avg. 10 yrs credit risk.
- ◆ Does not contain a relevant liquidity premium in the borrowing cost.

# Outline

- ◆ Summary
- ◆ Cost of Capital and WACC
- ◆ Calculation for a Norwegian Mobile operator
- ◆ Main WACC-parameters
  - Risk free rate
  - Market premium
  - Credit Risk premium
  - Asset Beta
    - International diversified investor



## Asset betas for Telecom and Mobile operation

- ◆ Update my analysis from October 2009
- ◆ Based on 5 yrs monthly return data for Jan 08 – Dec 13 for 6 mobile and 13 integrated telecom companies
- ◆ Calculate betas against a national stock index and against an USD global index with stock returns either in local currency or USD
- ◆ Choose betas with (i) local currency stock returns and (ii) measured against USD returns on a global index
- ◆ Currency translation of local returns is viewed as questionable by most international analysts (what is a currency risk premium?) and risk premiums should reflect the diversification in a professional portfolio

- ◆ I conclude that the representative Asset Beta value for a Mobile operator should be reduced to 0.90 from my previous estimate of 1.15 in 2009 (data for Oct 04 – Sep 09)
- ◆ Estimated Betas have been stable at 1.0 for Telenor (when we exclude the 30 % 29.10.08 Unitech-loss), but have been steadily falling for other firms since 2005
- ◆ I use a significantly higher asset beta 0.90 than the beta of 0.60 now suggested by the UK, Swedish and Danish regulators
  - I think that a main part of the fall in estimated European telecom betas is due to a temporary high stock index risk caused by lower effective stock diversification (high inter-stock crisis correlation)

# European Telecom companies in the analysis

Company	Country	Exchange listing	Free float <sup>1,2</sup>	Enterprise Value <sup>1,3</sup>	E/(E+D) <sup>4</sup>	Rating <sup>1</sup>	% share of 2011 sales		
							Mobile	Fixed	Other
<b>Mobile companies:</b>									
Telenor	<b>Norway</b>	jan.01	46 %	175	0,80	A-	<b>79</b>	14	7
Tele2	<b>Sweden</b>	jun.96	69 %	63	0,85		<b>76</b>	9	15
Vodafone	UK	jun.96	100 %	1 049	0,80	A-	<b>94</b>	-	6
Mobistar	Belgium	nov.98	47 %	21	0,98		<b>100</b>	-	-
Drillisch	Germany	mai.98	87 %	4	0,95		<b>100</b>	-	-
Sonaecom	Portugal	jul.00	27 %	6	0,76		<b>69</b>	-	31
<b>Integrated Telecom operators:</b>									
TeliaSonera	<b>Sweden</b>	jul.00	51 %	245	0,91	A-	<b>64</b>	14	22
TDC	<b>Denmark</b>	jun.96	43 %	62	0,63	BBB	<b>28</b>	36	36
Elisa	<b>Finland</b>	aug.99	84 %	27	0,83	BBB	<b>61</b>	16	23
British Telecom	UK	jun.96	100 %	253	0,64	BBB+	<b>4</b>	61	35
KPN	Holland	jun.96	63 %	200	0,68	BBB+	<b>61</b>	11	28
Deutsche Telekom	Germany	des.96	68 %	670	0,63	BBB+	<b>50</b>	14	36
France Telecom	France	nov.97	74 %	510	0,61	A-	<b>56</b>	41	3
Telecom Italia	Italy	jun.96	78 %	343	0,45	BBB	<b>57</b>	31	12
Portugal Telecom	Portugal	jun.96	64 %	92	0,80	BB+	<b>71</b>	29	*
Telefonica	Spain	jun.96	88 %	1 045	0,71	BBB	<b>62</b>	25	13
Telecom Austria	Austria	des.00	49 %	58	0,70	BBB	<b>62</b>	15	23
Swisscom	Switzerland	nov.98	43 %	171	0,85	A	<b>35</b>	25	40
Hellenic Telecom	Greece	jun.96	50 %	44	0,80	B-	<b>36</b>	50	14

<sup>1</sup> At 31. desember 2011.

<sup>2</sup> %-share of outstanding shares not controlled by strategig owners.

<sup>3</sup> Sum market capitalization of equity and net debt (interest bearing debt minus current financial assets).

<sup>4</sup> Market Cap / (Market Cap + Net Debt); average 2007-11.

# Equity and Asset Betas for Jan 08 – Dec 13

Company	Country	% sales		Equity beta <sup>2</sup>			Asset beta <sup>4</sup>			
		Value <sup>1</sup>	mobile	National	Internat.	\$Internat. E/(E+D) <sup>3</sup>	National	Internat.	\$Internat.	
<b>Mobil companies</b>										
Telenor <sup>5</sup>	Norway	185	79	0,96	<b>1,14</b>	1,65	0,86	0,83	<b>0,99</b>	1,42
				1,16	<b>1,42</b>	1,93		1,00	1,23	1,66
Tele2	Sweden	49	76	0,80	<b>0,79</b>	1,36	0,91	0,73	<b>0,72</b>	1,24
Vodafone	UK	1 076	94	0,55	<b>0,33</b>	0,63	0,72	0,39	<b>0,24</b>	0,45
Mobistar	Belgium	29	100	0,22	<b>0,16</b>	0,59	0,93	0,20	<b>0,15</b>	0,55
Drillisch	Germany	2	100	1,67	<b>1,72</b>	2,15	0,81	1,36	<b>1,39</b>	1,74
Sonaecom	Portugal	9	69	1,30	<b>1,14</b>	1,57	0,63	0,82	<b>0,72</b>	0,99
<b>Average</b>			<b>86</b>	<b>0,92</b>	<b>0,88</b>	<b>1,32</b>	<b>0,81</b>	<b>0,72</b>	<b>0,70</b>	<b>1,07</b>
			<i>weighted w/mobile share</i>	<i>0,90</i>	<i>0,86</i>	<i>1,30</i>	<i>0,82</i>	<i>0,71</i>	<i>0,69</i>	<i>1,05</i>
<b>Median</b>			<b>87</b>	<b>0,88</b>	<b>0,96</b>	<b>1,47</b>	<b>0,84</b>	<b>0,77</b>	<b>0,72</b>	<b>1,11</b>
<b>Integrated telecom</b>										
TeliaSonera	Sweden	248	64	0,59	<b>0,56</b>	1,14	0,83	0,49	<b>0,46</b>	0,94
TDC	Denmark	88	28	0,27	<b>0,62</b>	1,03	0,61	0,17	<b>0,38</b>	0,63
Elisa	Finland	29	61	0,57	<b>0,72</b>	1,16	0,78	0,44	<b>0,56</b>	0,90
British Telecom	UK	227	4	1,08	<b>0,91</b>	1,21	0,55	0,60	<b>0,50</b>	0,67
KPN	Holland	245	61	0,12	<b>0,00</b>	0,43	0,62	0,07	<b>0,00</b>	0,27
Deutsche Telek	Germany	782	50	0,43	<b>0,23</b>	0,66	0,56	0,24	<b>0,13</b>	0,37
France Telecom	France	727	56	0,34	<b>0,28</b>	0,71	0,60	0,20	<b>0,17</b>	0,43
Telecom Italia	Italy	423	57	0,71	<b>0,70</b>	1,13	0,34	0,24	<b>0,24</b>	0,39
Portugal Telecom	Portugal	162	71	0,82	<b>0,52</b>	0,96	0,71	0,58	<b>0,37</b>	0,68
Telefonica	Spain	1 205	62	0,74	<b>0,62</b>	1,05	0,66	0,49	<b>0,41</b>	0,69
Telecom Austria	Austria	73	62	0,50	<b>0,59</b>	1,03	0,60	0,30	<b>0,36</b>	0,62
Swisscom	Switzerla	183	35	0,37	<b>0,10</b>	0,41	0,69	0,25	<b>0,07</b>	0,28
Hellenic Telecon	Greece	108	36	1,13	<b>1,33</b>	1,75	0,60	0,67	<b>0,79</b>	1,04
<b>Average</b>			<b>50</b>	<b>0,59</b>	<b>0,55</b>	<b>0,97</b>	<b>0,63</b>	<b>0,36</b>	<b>0,34</b>	<b>0,61</b>
			<i>vektet m/mobilandel</i>	<i>0,56</i>	<i>0,51</i>	<i>0,95</i>	<i>0,64</i>	<i>0,35</i>	<i>0,33</i>	<i>0,61</i>
<b>Median</b>			<b>57</b>	<b>0,57</b>	<b>0,59</b>	<b>1,03</b>	<b>0,61</b>	<b>0,30</b>	<b>0,37</b>	<b>0,63</b>

1 Sum market cap and net interestbearing debt per 31.12.12; NOK billions.

2 Monthly stock returns for 5 yrs period 2008-13. 'National': Against national exchange (both national currency).

'International': Local stock return against \$ MSCI World index; '\$International': USD stock return against \$ MSCI World index

3 Market cap Equity / Enterprise Value; avg 2007-11. 4 Equity beta multiplied by E/(E+D).

5 The stock return for October 2008 is adjusted for the 30 % loss on 29.10.08 from the Unitech deal.

6 Weighted with % fixed share of total 2011 sales.

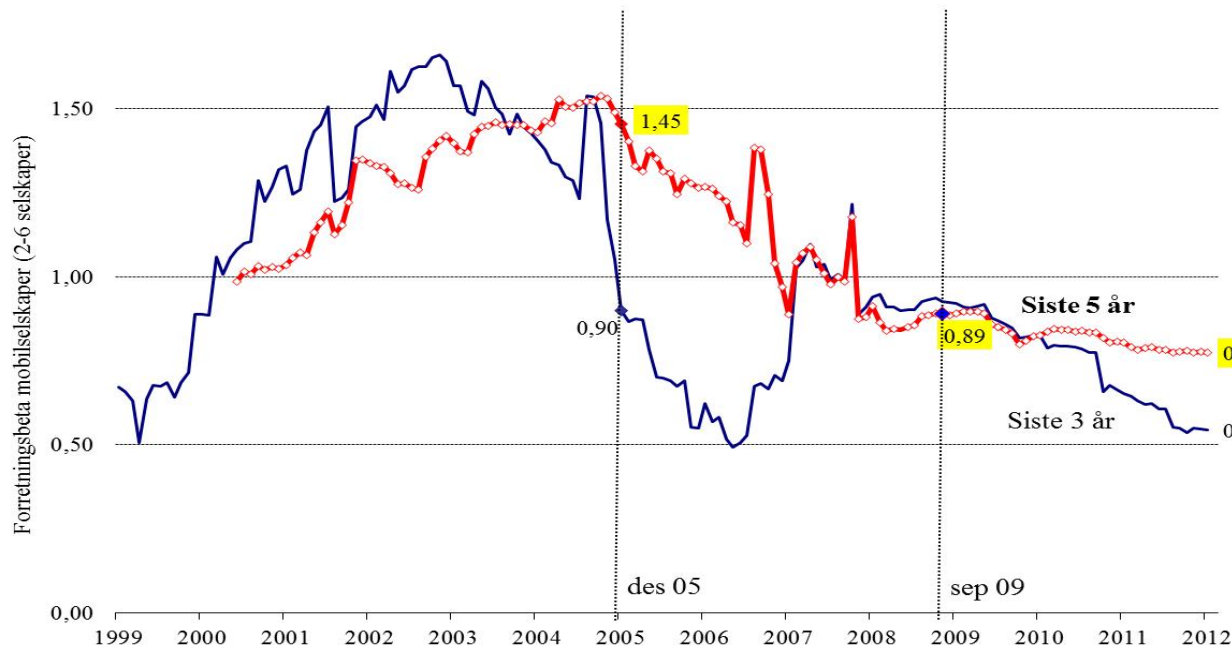
6 operators with mobile sales > 60%.

13 integrated Telecom operators

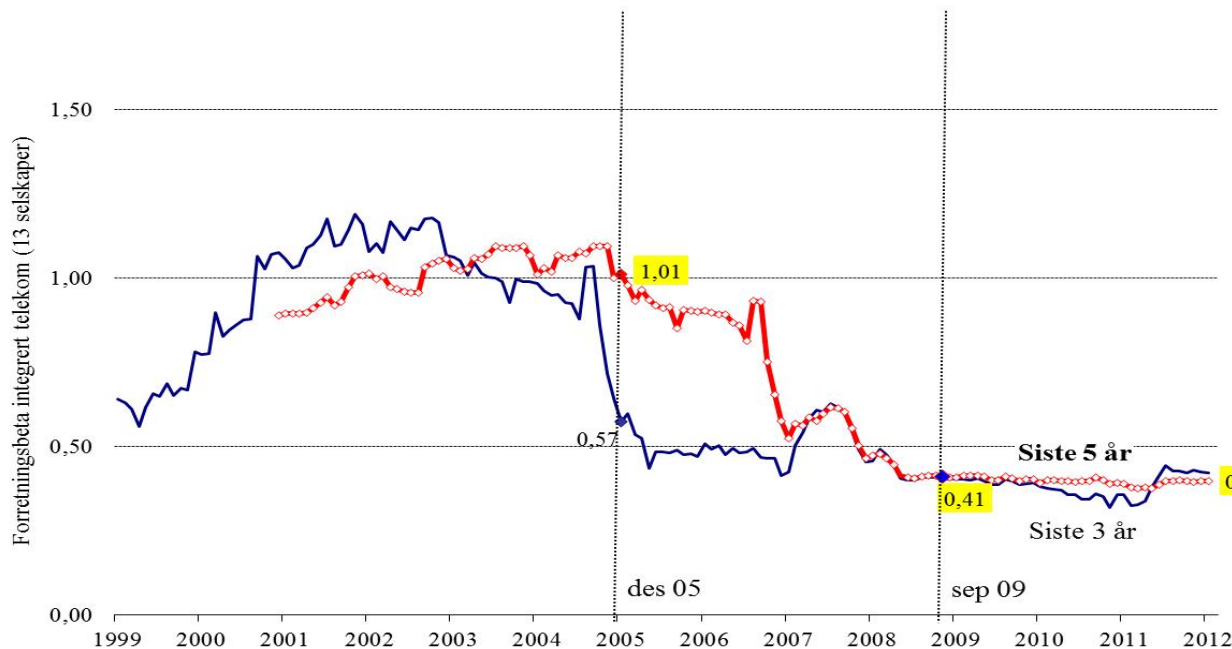
Use International betas (professional owner) w/stock return in local currency (see below)

# Average Asset Betas: Rolling 5 & 3 yrs estimates

## International beta values (local currency stock return)

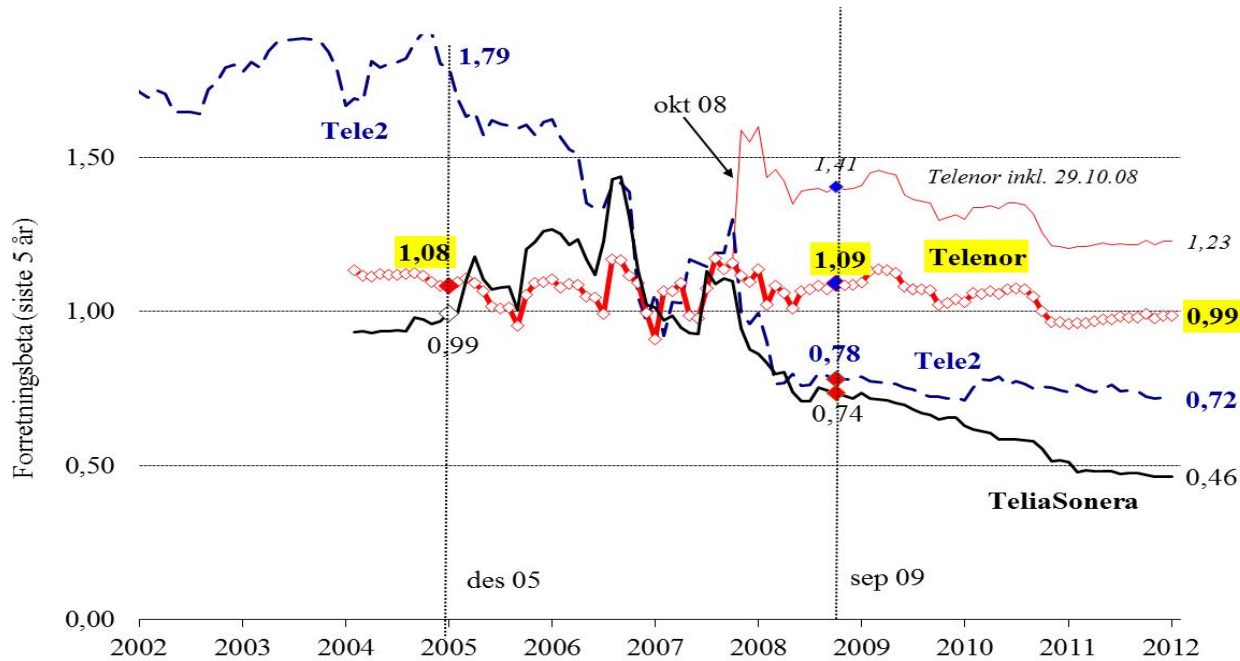


- ◆ 2 - 6 Mobile firms
- ◆ Steadily falling from a peak in 03 (3yr)-05 (5yr)
- ◆ Run-up w/dot.com
- ◆ Jan 13: 0.77 – 0.54

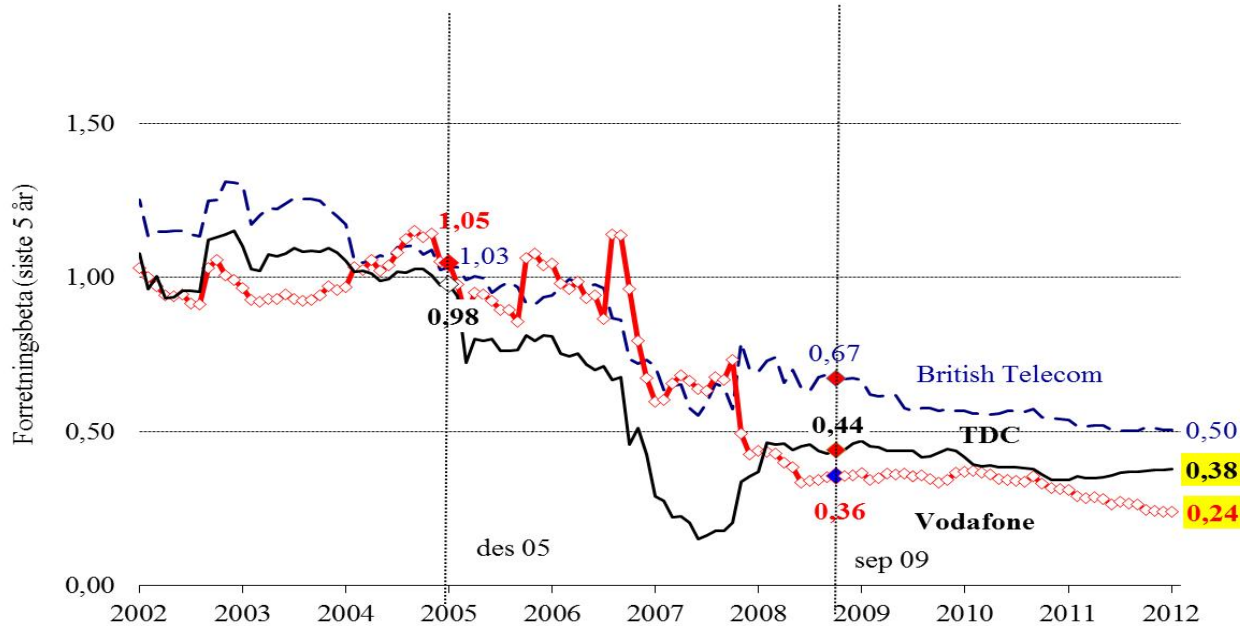


- ◆ 5-13 integrated operators
- ◆ Steadily falling from a peak in 03-05 (5 yr).
- ◆ Jan 13: 0.40 (stable)

# 5 years international Asset Betas for Nordic and UK



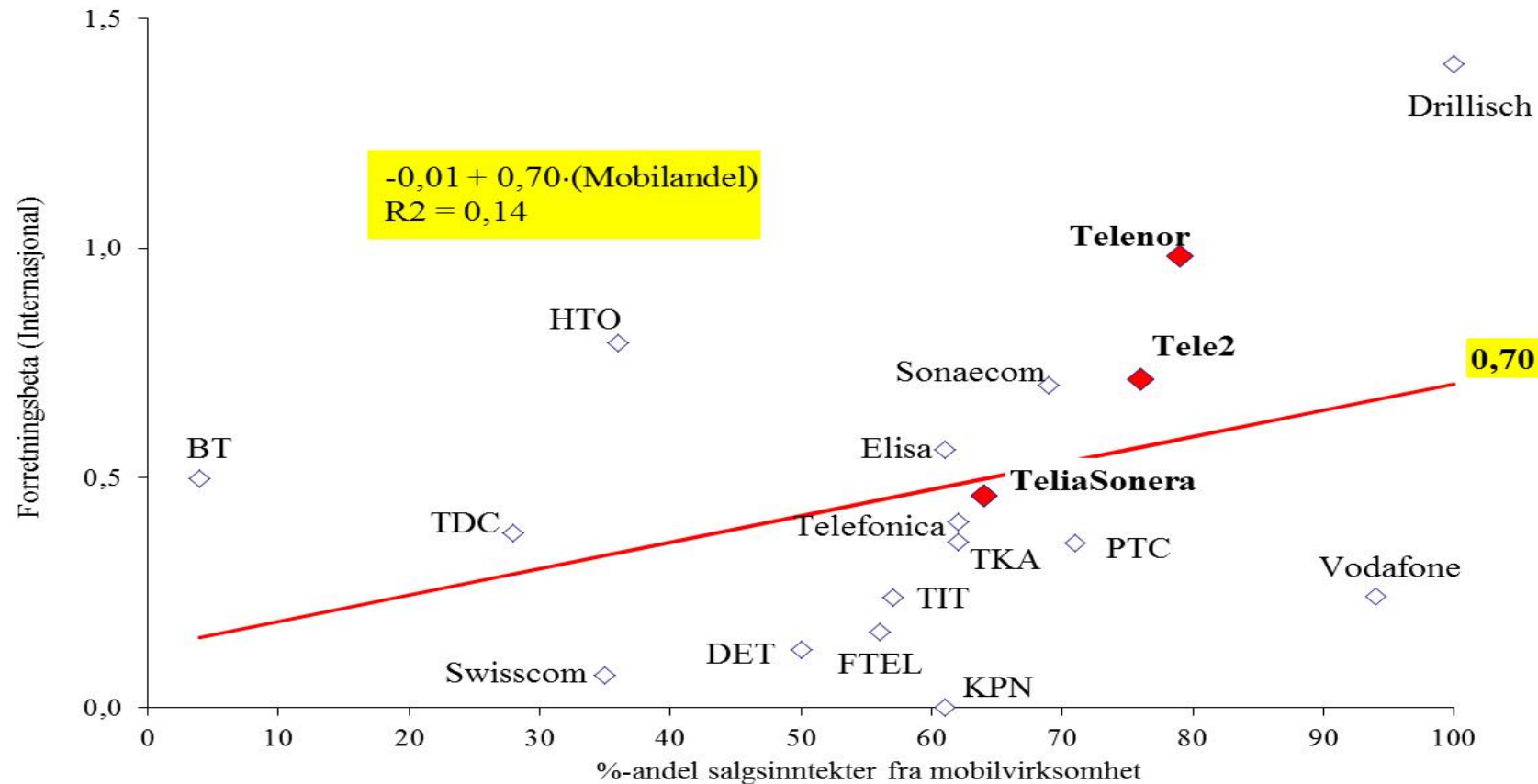
- ◆ Stable asset beta 1.0 for Telenor (removing the 29.10.08 Unitech-loss)
- ◆ Steadily falling beta for Tele2 and TeliaSonera
- ◆ Dec.12:  $\beta = 0.50 - 1.00$



- ◆ Steadily falling betas for Vodafone and TDC (BT has no mobile service)
- ◆ Dec.12:  $\beta = 0.25 - 0.40$

# Linear regression of Asset Betas vs % mobile sales

- ◆ Pool all estimated Asset Beta to infer the implicit value of a pure mobile operator  $\Rightarrow \beta = 0.70$



- ◆ I use an Asset Beta of 0.90 for Nordic mobile business, reflecting the relatively high betas for Telenor and Tele2

# A simple calibration exercise for Telenor ASA

	% share of EV <sup>1</sup>	Asset beta
Fixed net Norway	12,0	<b>0,50</b>
Mobile Nordic	23,0	<b>0,90</b>
Mobile other	65,0	<b>1,15</b>
Telenor ASA	100,0	<b>1,01</b>

<sup>1</sup> Share of Enterprise Value.

Ref. table 7 in (Johnsen 2010) adjusted to 2012.

- ◆ Asset beta for Telenor ASA estimated to 1.0



# Comparison with beta-estimates for OSE-firms

Kapitalvektede gjennomsnitt

	# selskaper	Børs-verdi <sup>1</sup>	EK-beta <sup>2</sup>				Forretningsbeta				
			Lokal	Internasj.	\$Internasj.	Egenkap. andel <sup>3</sup>	Lokal	Internasj.	\$Internasj.		
			Nok:Nok	Nok:Nok	Nok:Usd	Usd:Usd		Nok:Nok	Nok:Nok	Nok:Usd	Usd:Usd
Oslo Børs	195	1 631	1,00	1,31	<b>1,09</b>	1,61	<b>0,80</b>	0,80	1,06	<b>0,87</b>	1,30
Største <sup>4</sup>	12	1 175	1,04	1,44	<b>1,18</b>	1,70	<b>0,78</b>	0,80	1,07	<b>0,88</b>	1,29
Finans	2	127	1,18	1,63	<b>1,49</b>	2,02	<b>0,11</b>	0,14	0,19	<b>0,17</b>	0,23
Olje	2	453	0,75	0,78	<b>0,65</b>	1,18	<b>0,91</b>	0,68	0,72	<b>0,59</b>	1,07
Industri, etc	10	464	1,18	1,68	<b>1,38</b>	1,91	<b>0,89</b>	1,06	1,50	<b>1,23</b>	1,70
Telekom	1	175	0,96	1,58	<b>1,14</b>	1,67	<b>0,86</b>	0,83	1,36	<b>0,99</b>	1,44
Shipping	5	73	1,02	2,63	<b>1,66</b>	2,18	<b>0,48</b>	0,49	1,25	<b>0,79</b>	1,04
Oljeservice	7	199	1,30	1,75	<b>1,51</b>	2,03	<b>0,70</b>	0,93	1,25	<b>1,07</b>	1,44

<sup>1</sup> Børsverdi i milliarder kroner pr 31.12.12.

<sup>2</sup> Verdivektede snitt snitt av aksjebetaverdier. Beta målt mot OB totalindeks ("Lokal") og i hhv NOK og USD mot MSCI verdensindeks, hhv "Internasj." (Nok:Nok eller Nok:Usd) og "\$Internasj." (Usd:Usd).

<sup>3</sup> Børsverdi egenkapital / (Børsverdi egenkapital + Nto rentebærende gjeld); snitt årsslutt 2007-2011.

<sup>4</sup> Børsverdi minst lik 1 % av børsens totalverdi (ekskluderer Gjensidige).

- ◆ Beta-estimates against an internationally index (MSCI \$-World) are significantly higher than against OSE
- ◆ In particular with \$-translated local returns or NOK-translated index returns

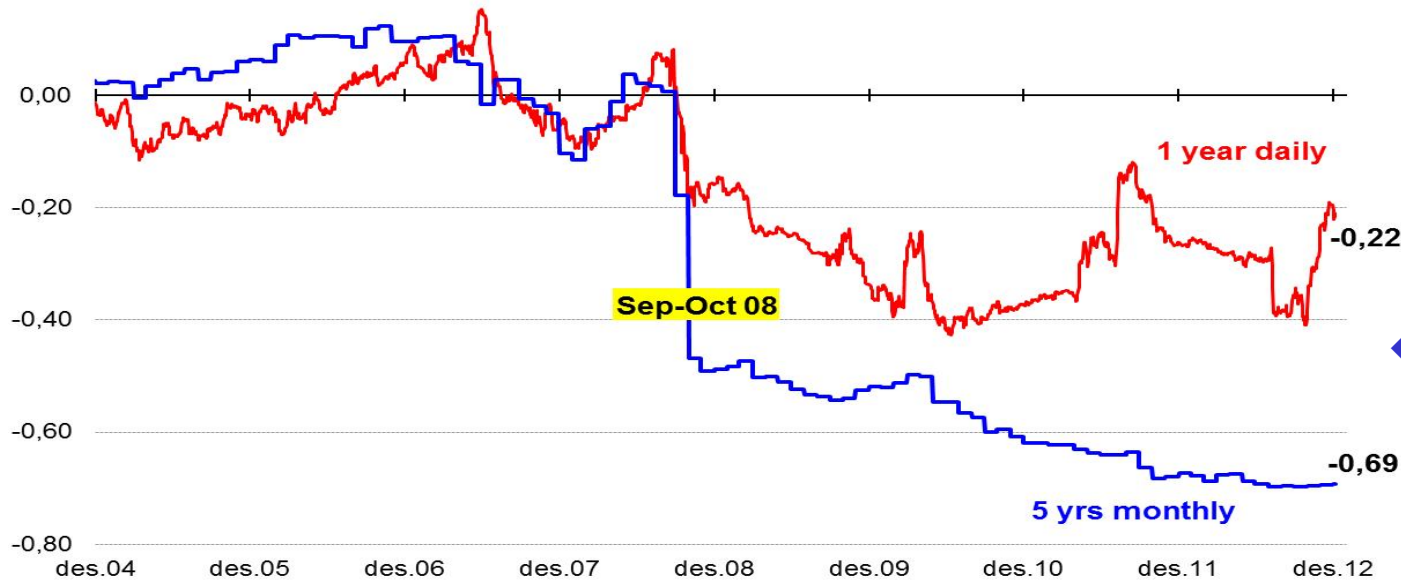
**From 2008: Corr(\$,R) << 0**

$$\beta = \frac{\text{Corr}_{i,M} \cdot \sigma(R_i)}{\sigma(R_M)}$$

$\sigma(R_i^{\text{nok}}) < \sigma(R_i^{\text{usd}}) \Rightarrow \beta_{n\$} < \beta_{\$\$}$   
 $\sigma(R_M^{\text{nok}}) \ll \sigma(R_M^{\text{usd}}) \Rightarrow \beta_{n\$} < \beta_{nn}$

# The dollar factor after 2008: S&P (or world) for NOK-investor

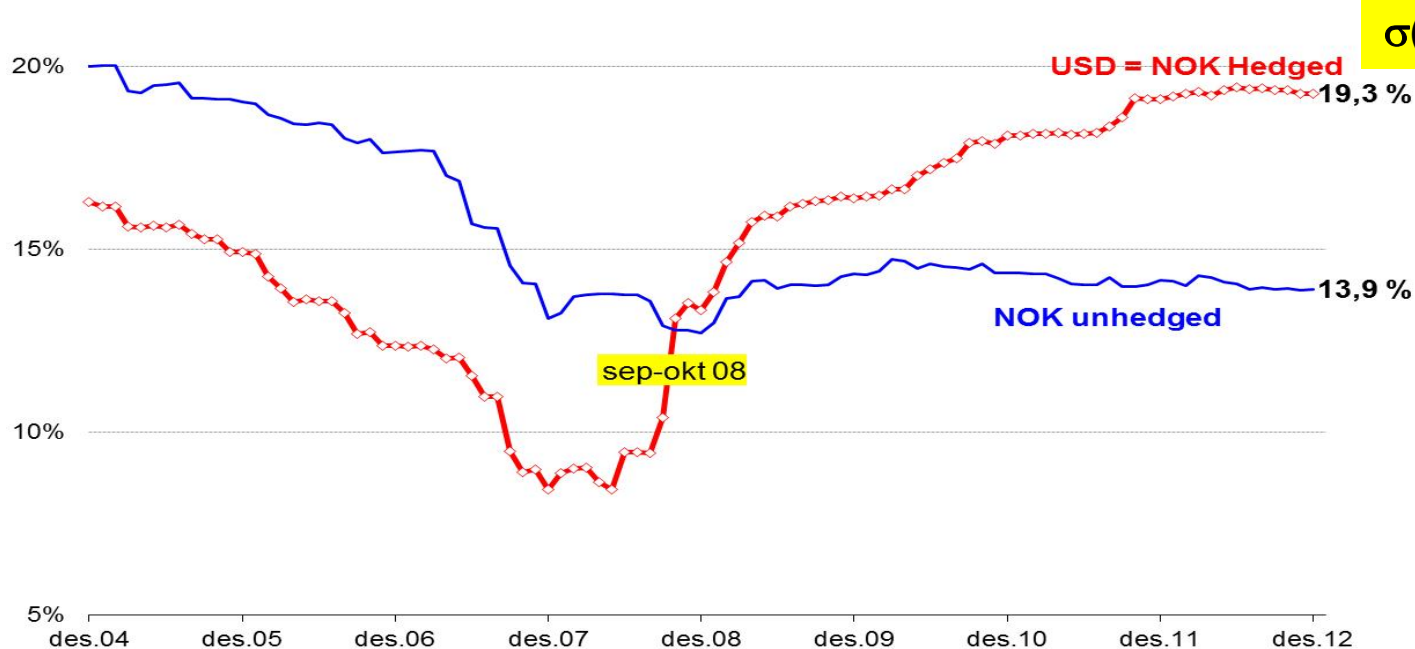
Correlation S&P500 with USD/NOK (returns)



◆ Extreme negative corr. USD/NOK with stocks (positive with bonds)

◆ *Caused by reallocation between international equity and US treasury*

Std deviation S&P500 previous 60 months



$$\sigma(R_M^{\text{nok}}) \ll \sigma(R_M^{\text{usd}}) \Rightarrow \beta_{n\$} < \beta_{nn}$$

◆ Do not hedge US equity (but hedge US bonds)

# Lower European telecom betas caused also by higher index risk

Selskap	Asset beta			Corr. w/index <sup>1</sup>			Volatility <sup>2</sup>		
	2005	2012	12/05	2005	2012	12/05	2005	2012	12/05
<b><u>Mobilselskaper</u></b>									
Telenor <sup>3</sup> <i>inkl. 29.10.08</i>	1,08	0,99	0,91	0,74	0,73	0,97	21	29	1,34
		1,23			0,74			35	
Tele2	1,79	0,72	0,40	0,70	0,55	0,79	38	27	0,73
Vodafone	1,05	0,24	0,23	0,54	0,39	0,73	29	13	0,44
Mobistar	0,86	0,15	0,17	0,44	0,15	0,33	28	21	0,74
Drillisch	2,64	1,39	0,53	0,51	0,58	1,15	76	50	0,66
Sonaecom	1,30	0,72	0,55	0,55	0,61	1,10	35	25	0,72
<b>Average</b>	<b>1,45</b>	<b>0,70</b>	<b>0,48</b>	<b>0,58</b>	<b>0,50</b>	<b>0,86</b>	<b>38</b>	<b>28</b>	<b>0,73</b>
<b><u>Telekomselskaper</u></b>									
TeliaSonera	0,99	0,46	0,47	0,49	0,54	1,11	30	18	0,60
TDC	0,98	0,38	0,38	0,57	0,54	0,94	25	15	0,59
Elisa	1,46	0,56	0,39	0,62	0,52	0,83	34	23	0,66
British Telecom	1,03	0,50	0,49	0,77	0,56	0,73	20	19	0,96
KPN	0,93	0,00	0,00	0,47	0,00	0,01	29	15	0,50
Deutsche Telekom	0,94	0,13	0,13	0,59	0,23	0,40	24	11	0,49
France Telecom	1,23	0,17	0,14	0,53	0,33	0,63	34	11	0,31
Telecom Italia	0,82	0,24	0,29	0,77	0,49	0,64	16	10	0,65
Portugal Telecom	1,01	0,37	0,37	0,60	0,37	0,62	25	21	0,85
Telefonica	1,03	0,41	0,39	0,66	0,55	0,84	23	16	0,68
Telecom Austria	0,24	0,36	1,47	0,37	0,40	1,10	10	19	1,91
Swisscom	0,36	0,07	0,20	0,36	0,14	0,39	15	11	0,74
Hellenic Telecom	0,65	0,79	1,21	0,45	0,49	1,08	21	34	1,61
<b>Average</b>	<b>0,90</b>	<b>0,34</b>	<b>0,38</b>	<b>0,56</b>	<b>0,40</b>	0,71	<b>24</b>	<b>17</b>	<b>0,73</b>
<b>Verdensindeks \$</b>	<b>1,00</b>	<b>1,00</b>		<b>1,00</b>	<b>1,00</b>		<b>15</b>	<b>21</b>	<b>1,44</b>

<sup>1</sup> Månedsavkastning for 5-års perioder jan.00-des.04, jan.01-des.05, okt.04-sep.09 og jan.08-des.12 mot MSCI \$-verdensindeks.

<sup>1</sup> Std.avvik avkastning 'enterprise value' (nedgearet aksjeavkastning) dividert med std.avvik indeksavkastning.

- ◆ 52 % fall in avg. mobile beta
- ◆ 14 % lower corr. w/index
- ◆ 50 % fall in relative volatility
- ◆ The 44 % increase in index volatility is mainly due to a crisis induced increase in inter-stock correlation

## Size effects on WACC

- ◆ Small firms have had higher expected returns
- ◆ The same applies to "Value" firms; low Price/Book
- ◆ Why higher returns ?
  - hurt worse in a recession?
  - higher liquidity risk?
  - estimated betas downward biased? (infrequent trade)
- ◆ Why not an increased WACC for small telecom firms?
  - a positive size effect outweighed by a negative high price/book effect
  - anyway, why should customers pay for any size effect?

## Sensitivity of the WACC-estimate

- ◆ Before tax WACC (28 % effective tax rate)
- ◆ Vary Asset Beta 0.7–1.1 / Risk Free Rate 3.5%-5.5%

Risk Free Rate	Asset beta		
	0,70	0,90	1,10
3,5	9,2	10,4	11,7
4,5	10,6	<b>11,8</b>	13,1
5,5	12,0	13,2	14,5

- ◆ Likely co-variation: North-West (lower RF and lower beta)

- ◆ Vary Asset Beta 0.7–1.1 / Market Premium 3.5%-5.5%

Market premium	Asset beta		
	0,70	0,90	1,10
3,5	9,6	10,6	11,5
4,5	10,6	<b>11,8</b>	13,1
5,5	11,5	13,1	14,6

- ◆ Likely co-variation: North-East (lower beta and higher MP)

# International WACC-estimates – Before tax

- ◆ UK: - 2.9% = - 1.0% RF / - 1.9% RP
- ◆ Sweden: - 2.4% = - 1.3% RF / - 1.3% RP

	Norge		UK <sup>1</sup>	Sverige <sup>2</sup>	Danmark <sup>3</sup>
	2009	2012	2011	2011	2012
<b><u>Før skatt:</u></b>					
Risikofri rente	6,9	6,3	5,3	5,0	3,2
Risikopremie	6,4	5,6	3,7	4,3	3,1
Lånekost		-0,05	0,07	0,04	
<b>VAK før skatt</b>	<b>13,3</b>	<b>11,8</b>	<b>9,0</b>	<b>9,4</b>	<b>6,3</b>
reell	10,6	9,1	6,4	7,3	4,4

## Parameter values:

<b>Risk free rate</b>	<b>5,00</b>	<b>4,50</b>	<b>4,00</b>	<b>3,71</b>	<b>2,40</b>
<i>Inflation</i>		2,50	2,50	2,00	1,80
<b>Market premium</b>	<b>4,00</b>	<b>4,50</b>	<b>5,00</b>	<b>5,00</b>	<b>3,85</b>
<b>Asset beta</b>	<b>1,15</b>	<b>0,90</b>	<b>0,56</b>	<b>0,64</b>	<b>0,60</b>
Leverage	0	0,20	0,30	0,25	0
<i>Equity beta</i>	1,15	1,13	0,80	0,85	0,60
Credit premium		1,50	1,50	1,50	
Corporate tax		0,28	0,24	0,26	0,25

<sup>1</sup> Wholesale mobile voice call termination; Statement; Ofcom statement, 22. mar 2011.

<sup>2</sup> Synpunkter på förslaget till mobilkalkylränta; PTS 9. februar 2011.

<sup>3</sup> Afgørelse om maksimal pris for terminering i TDC's mobilnet; Erhvervsstyrelsen 17. juli 2012.