

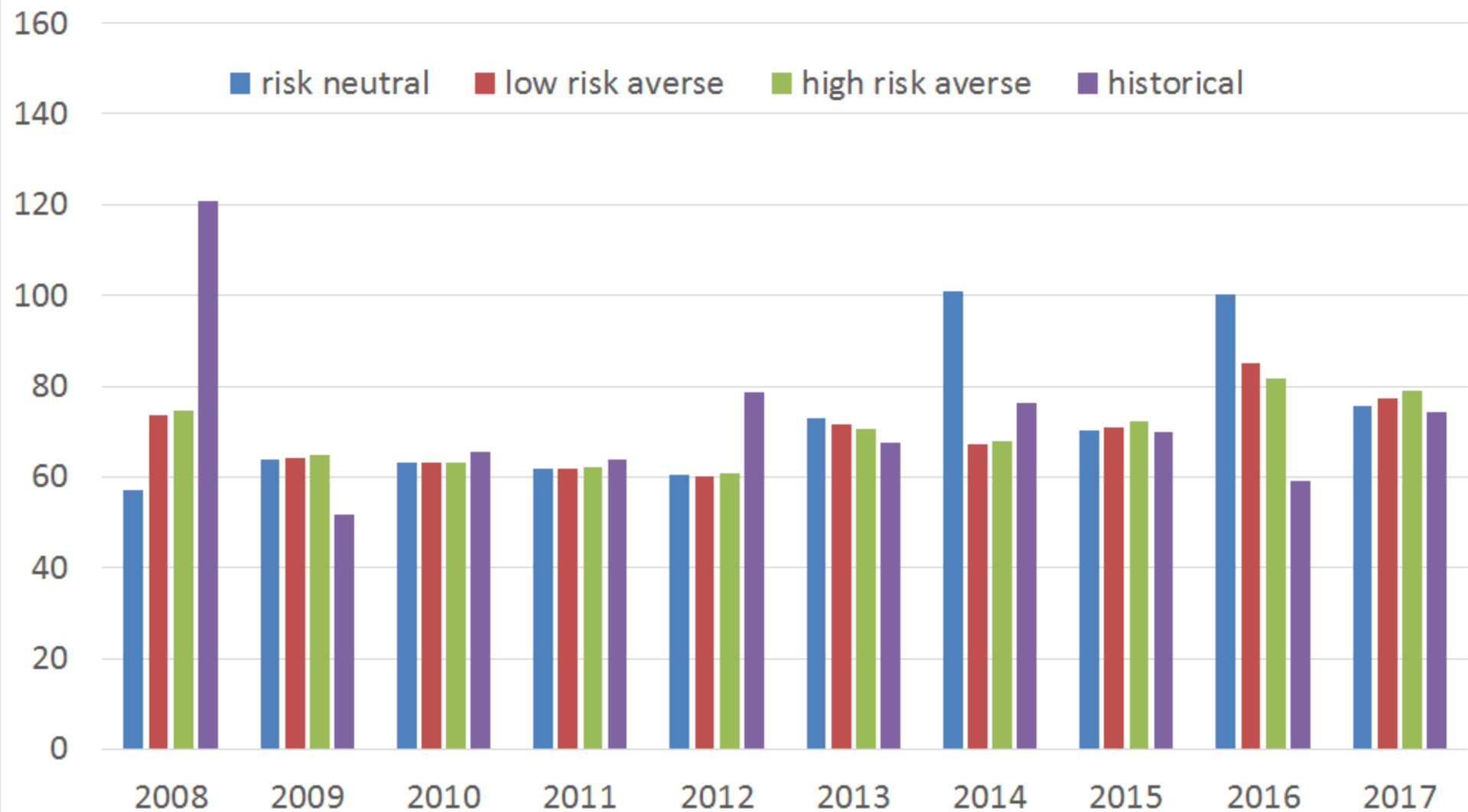
Appendix A

Charts and Tables for

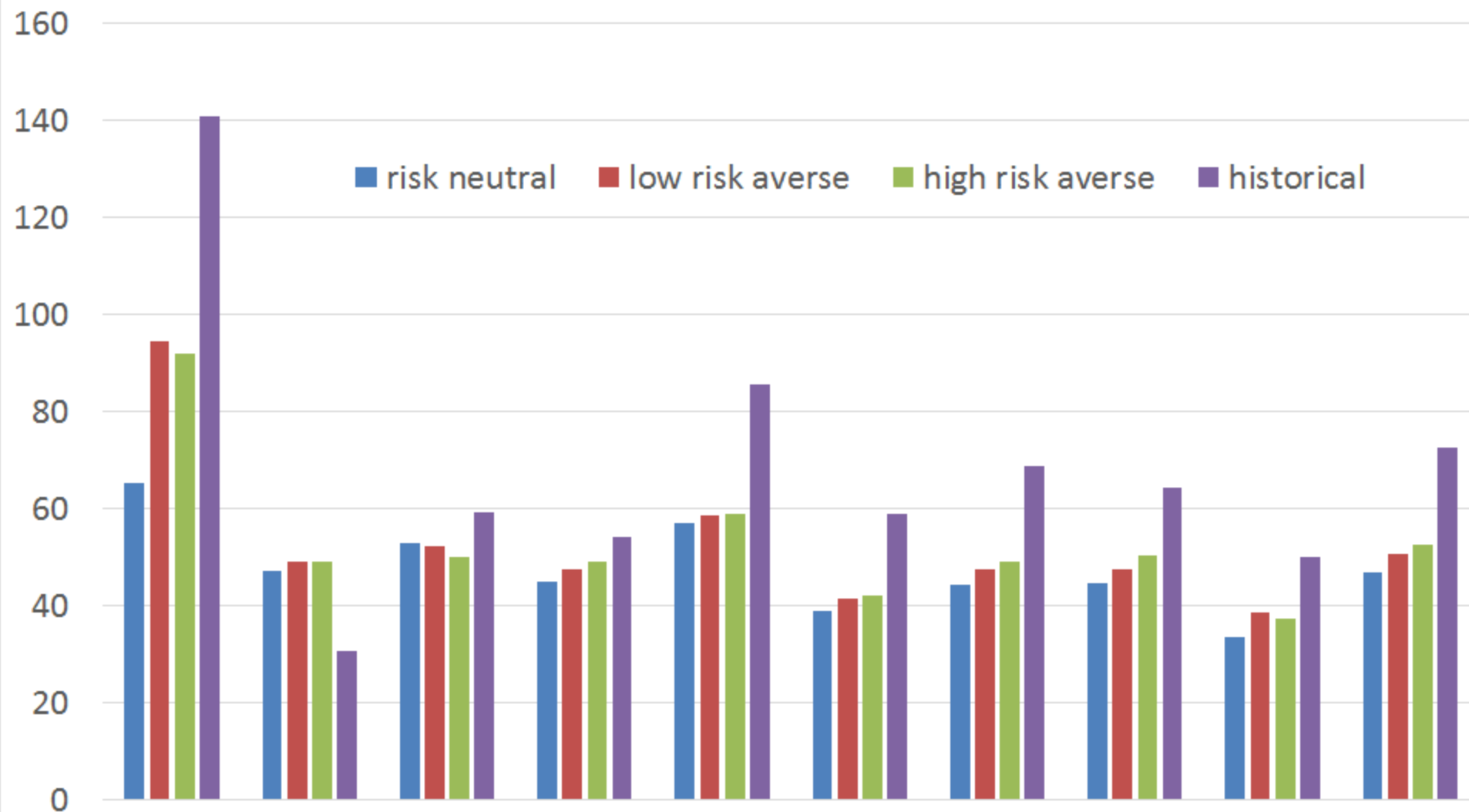
Efficiency of the New Zealand wholesale electricity market 2008-2017

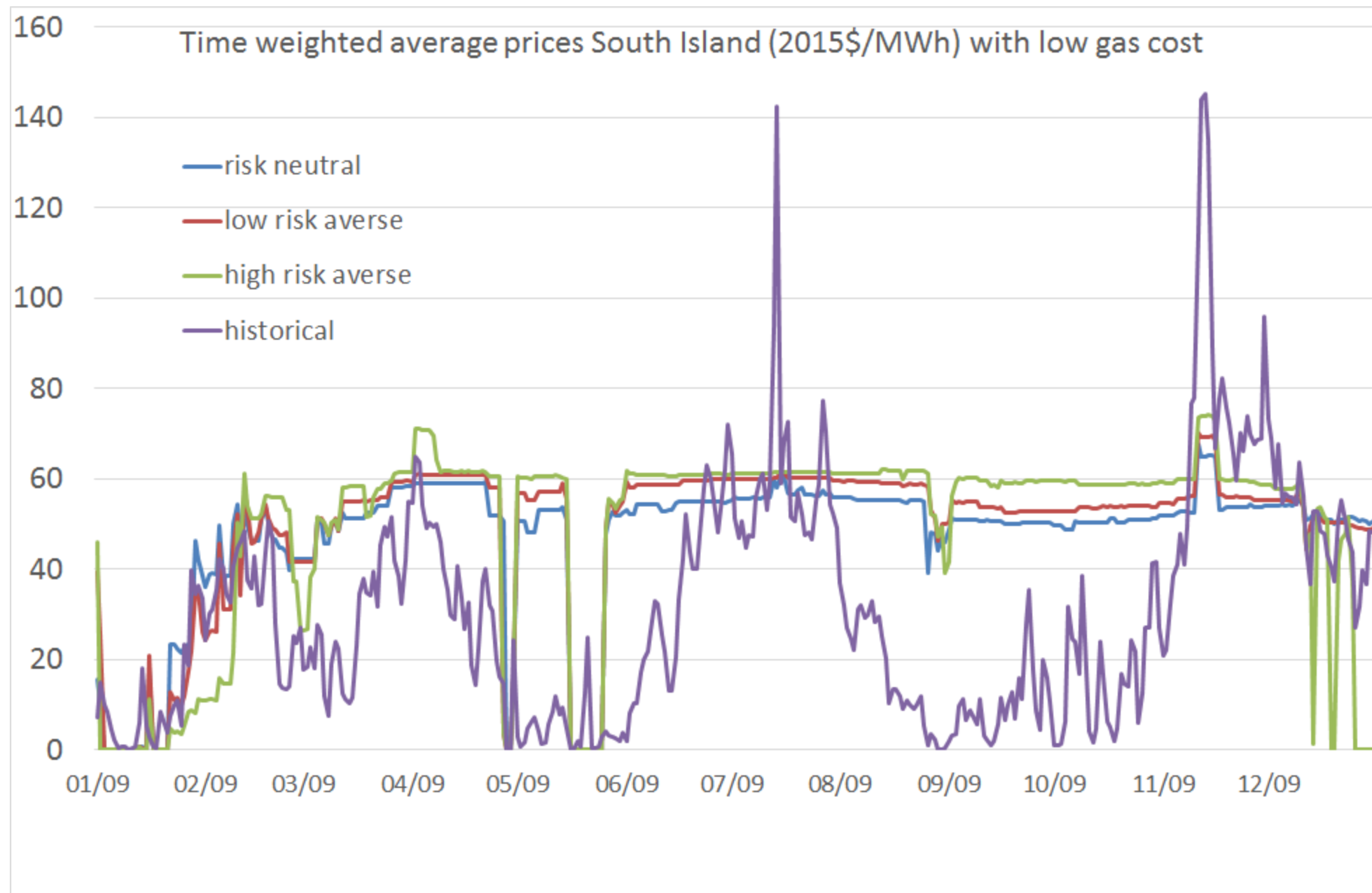
Results assuming MBIE gas costs

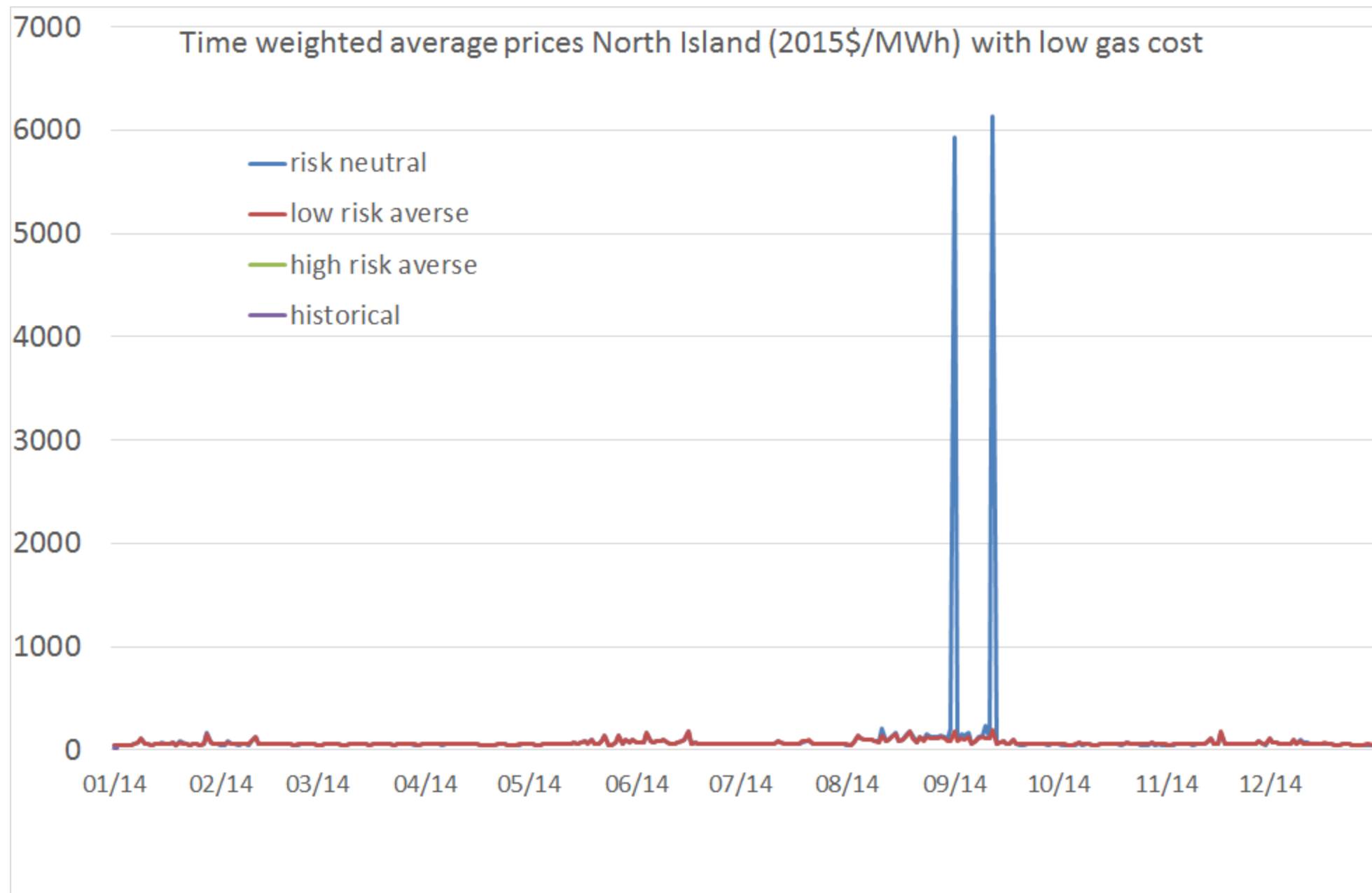
Time weighted average prices North Island (2015\$/MWh)with low gas cost

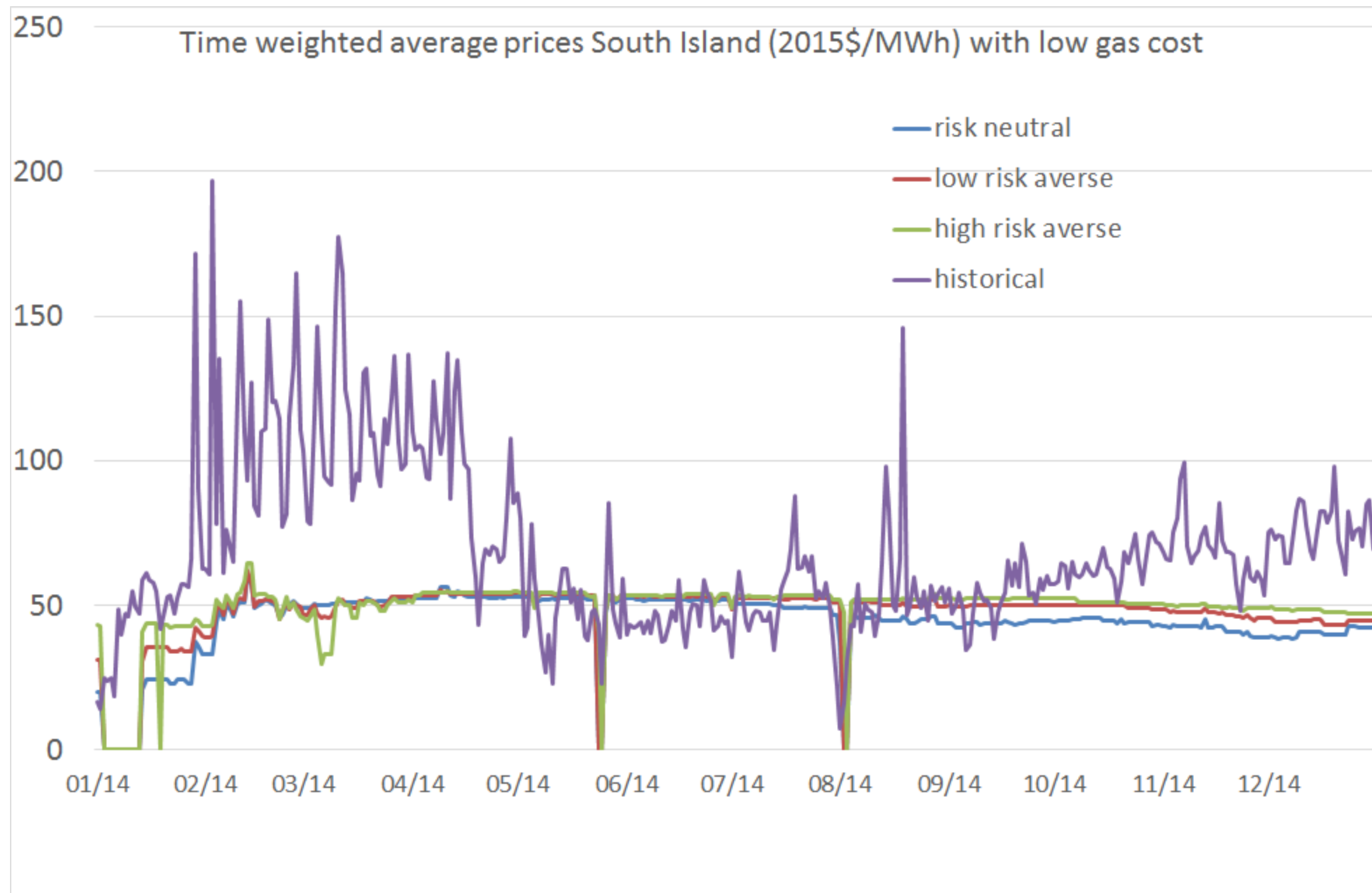


Time weighted average prices South Island (2015\$/MWh)with low gas cost



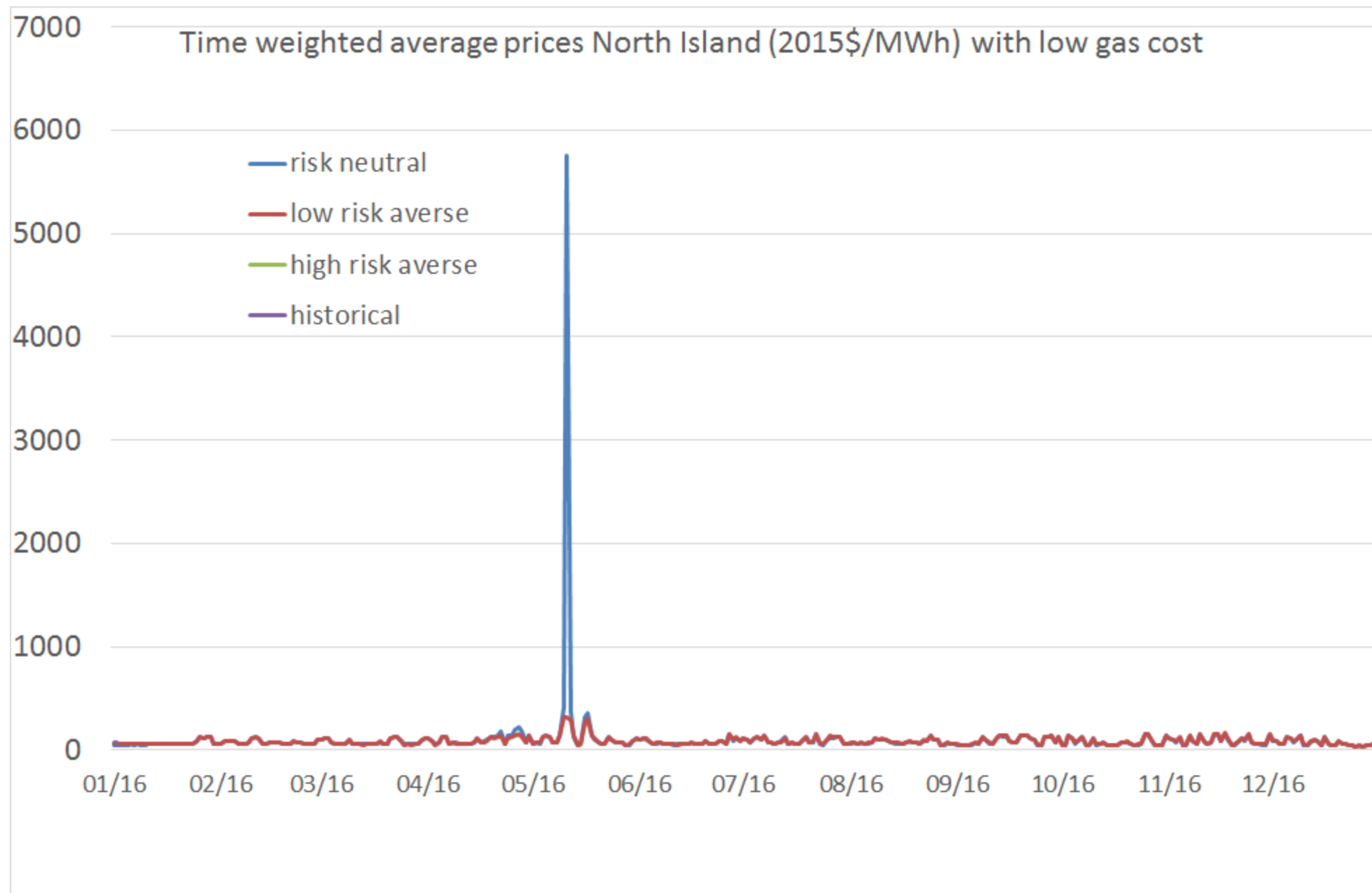




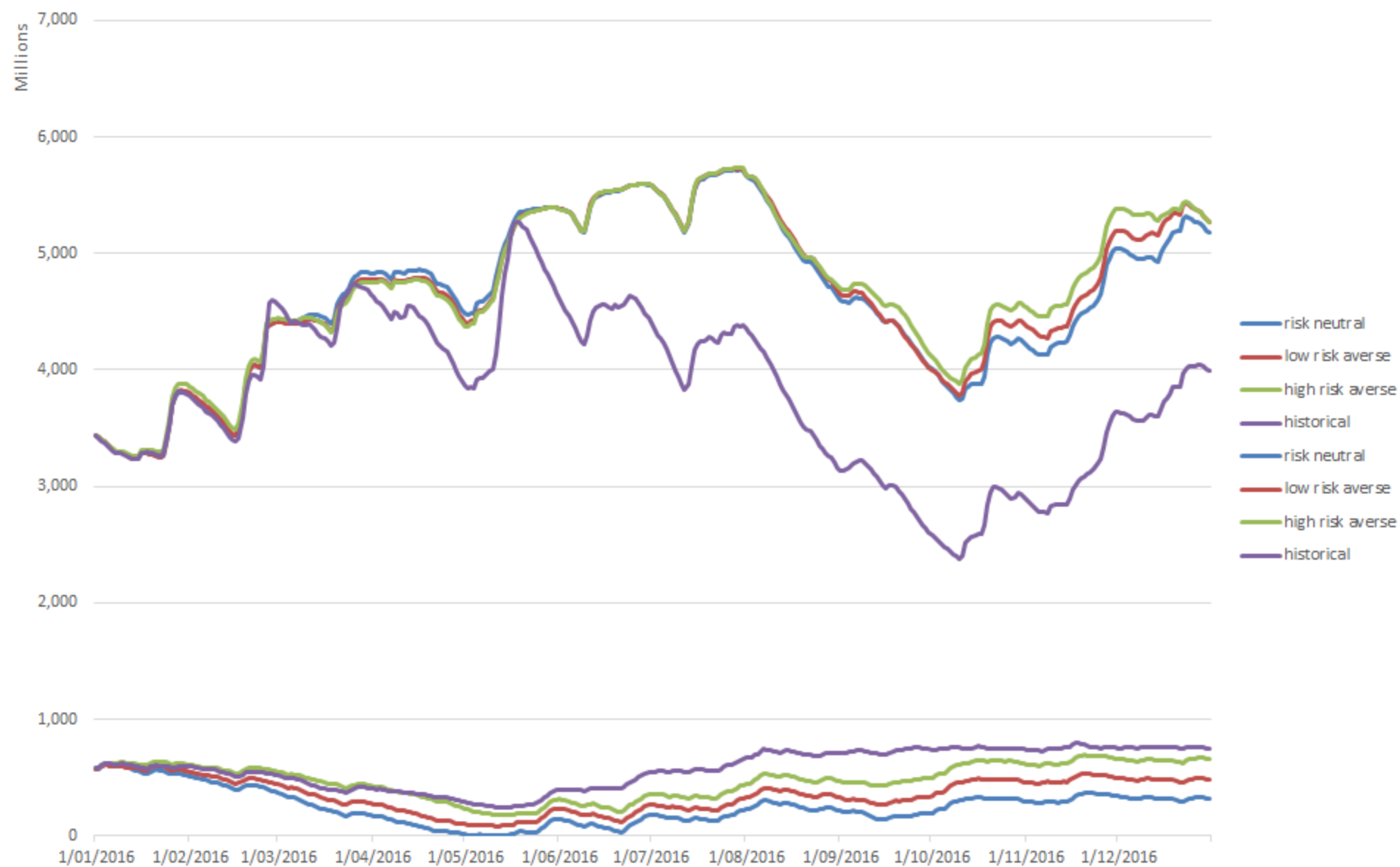


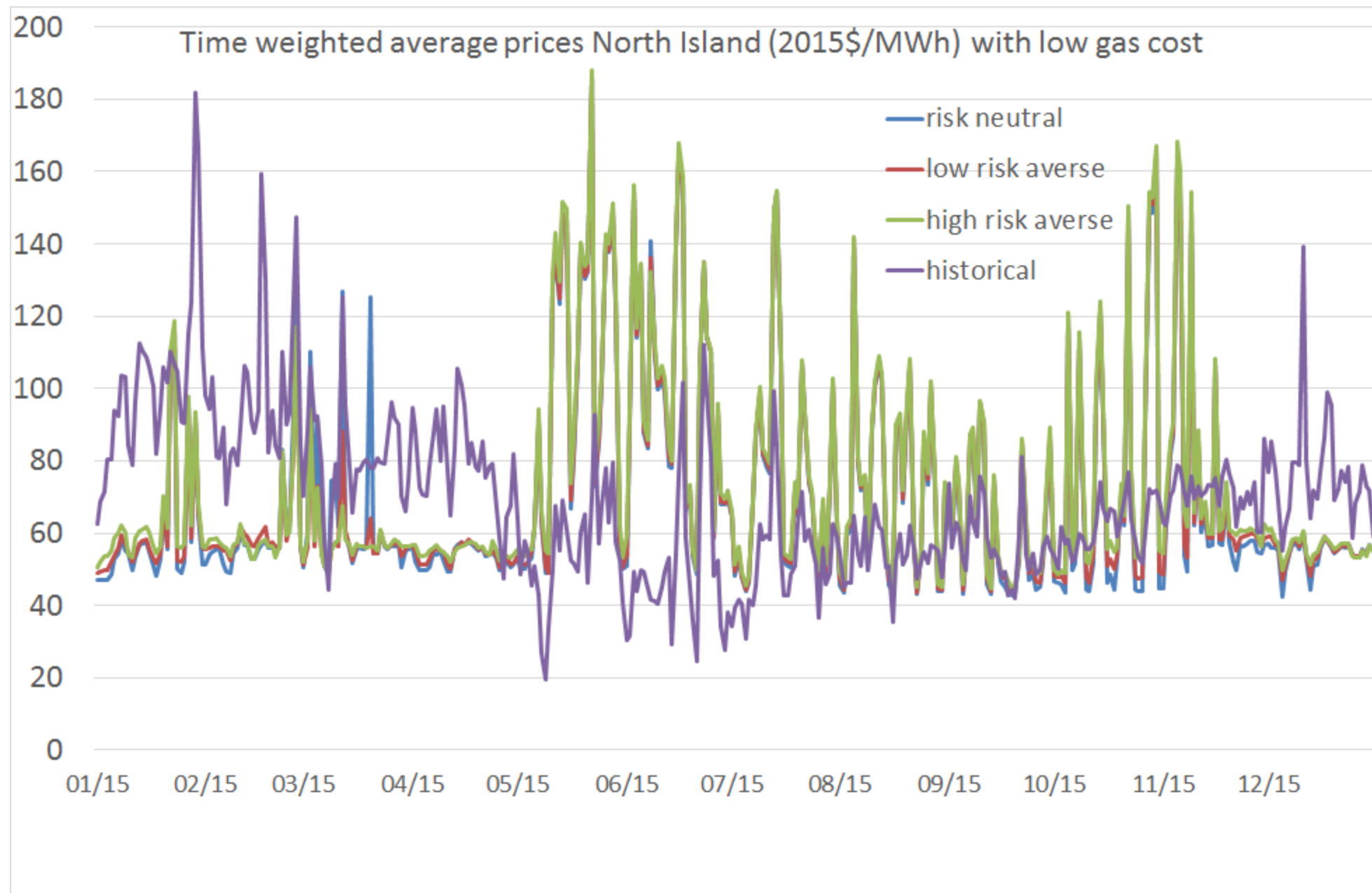
North Island and South Island storage in 2014

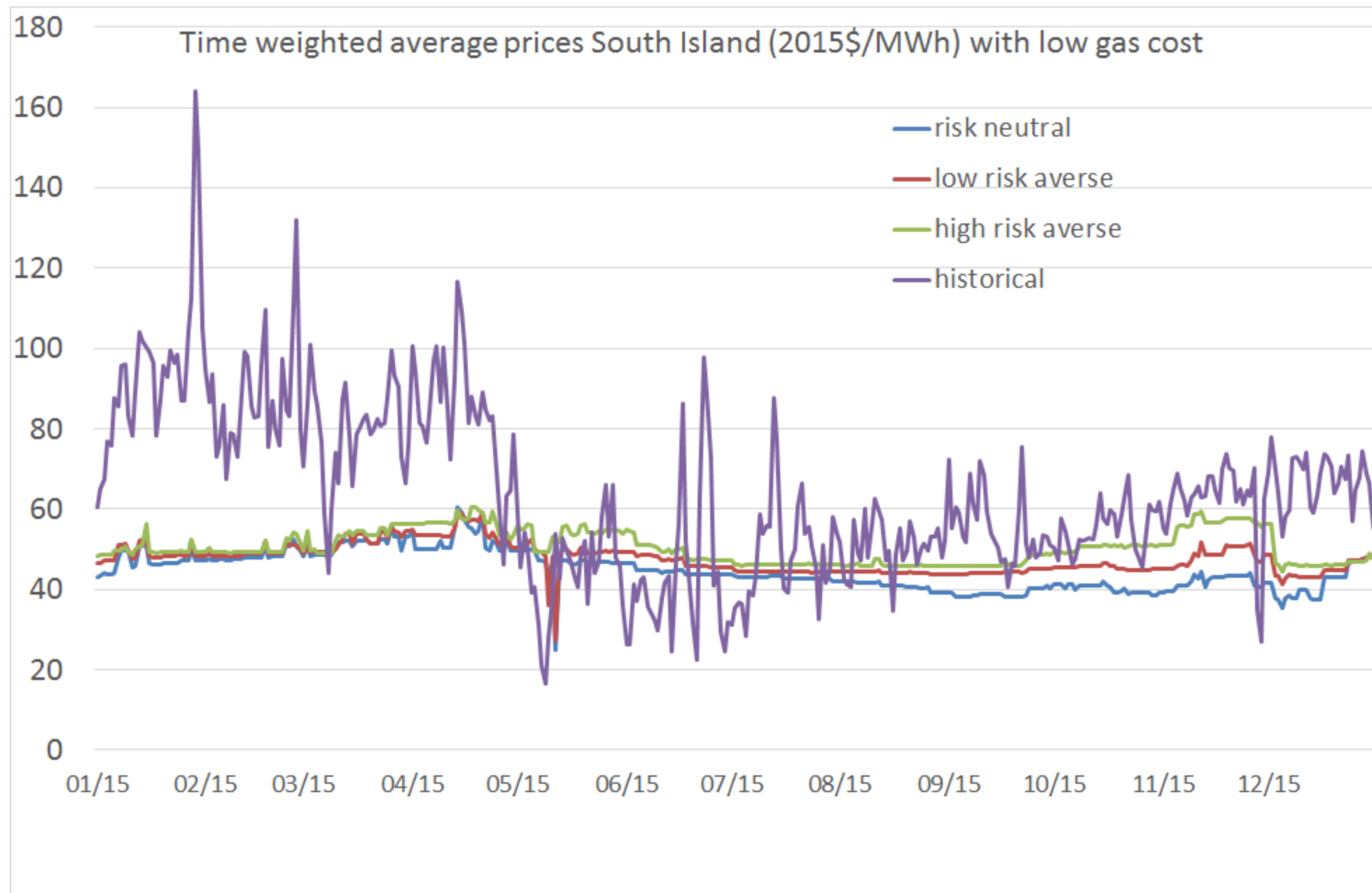




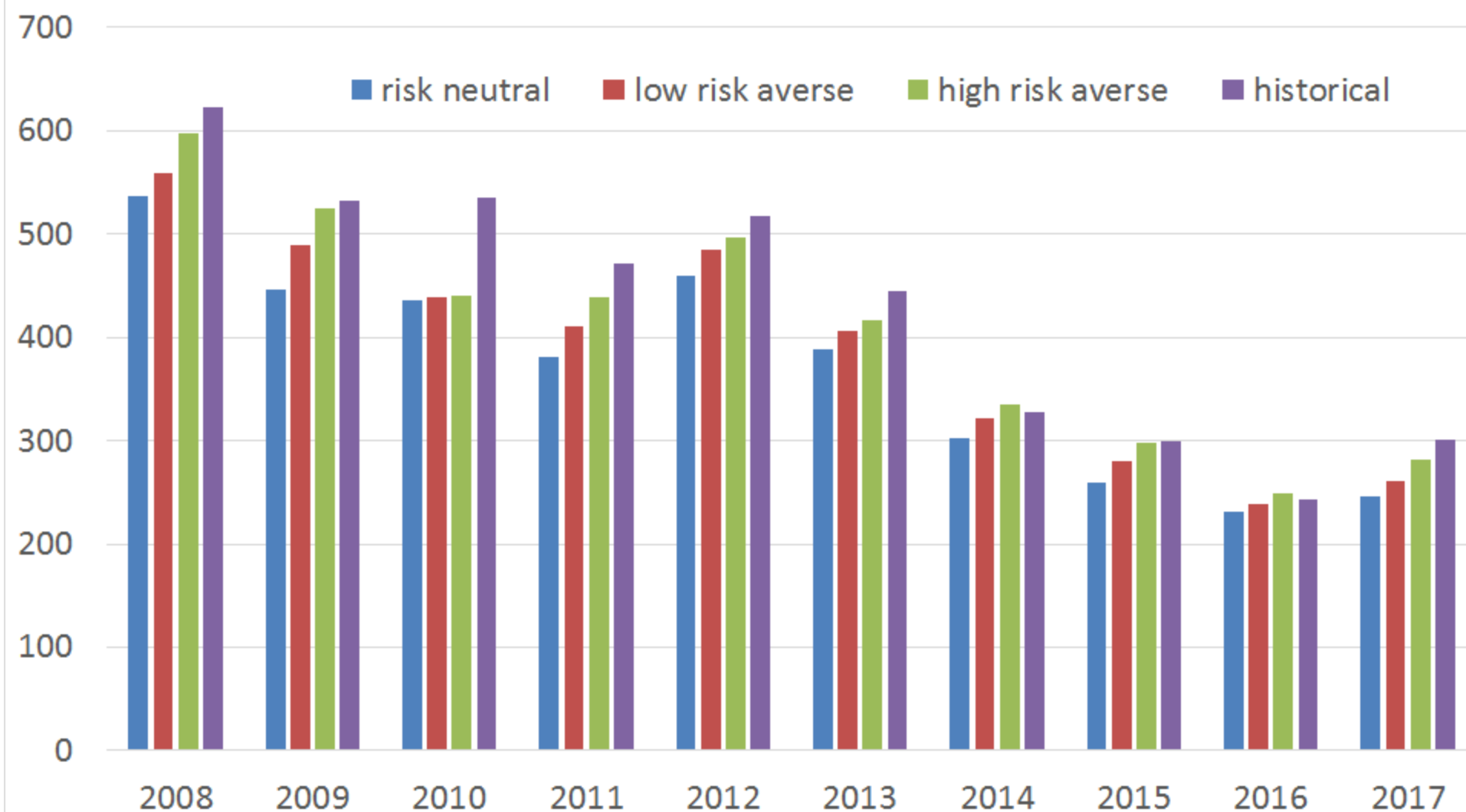
North Island and South Island storage in 2016



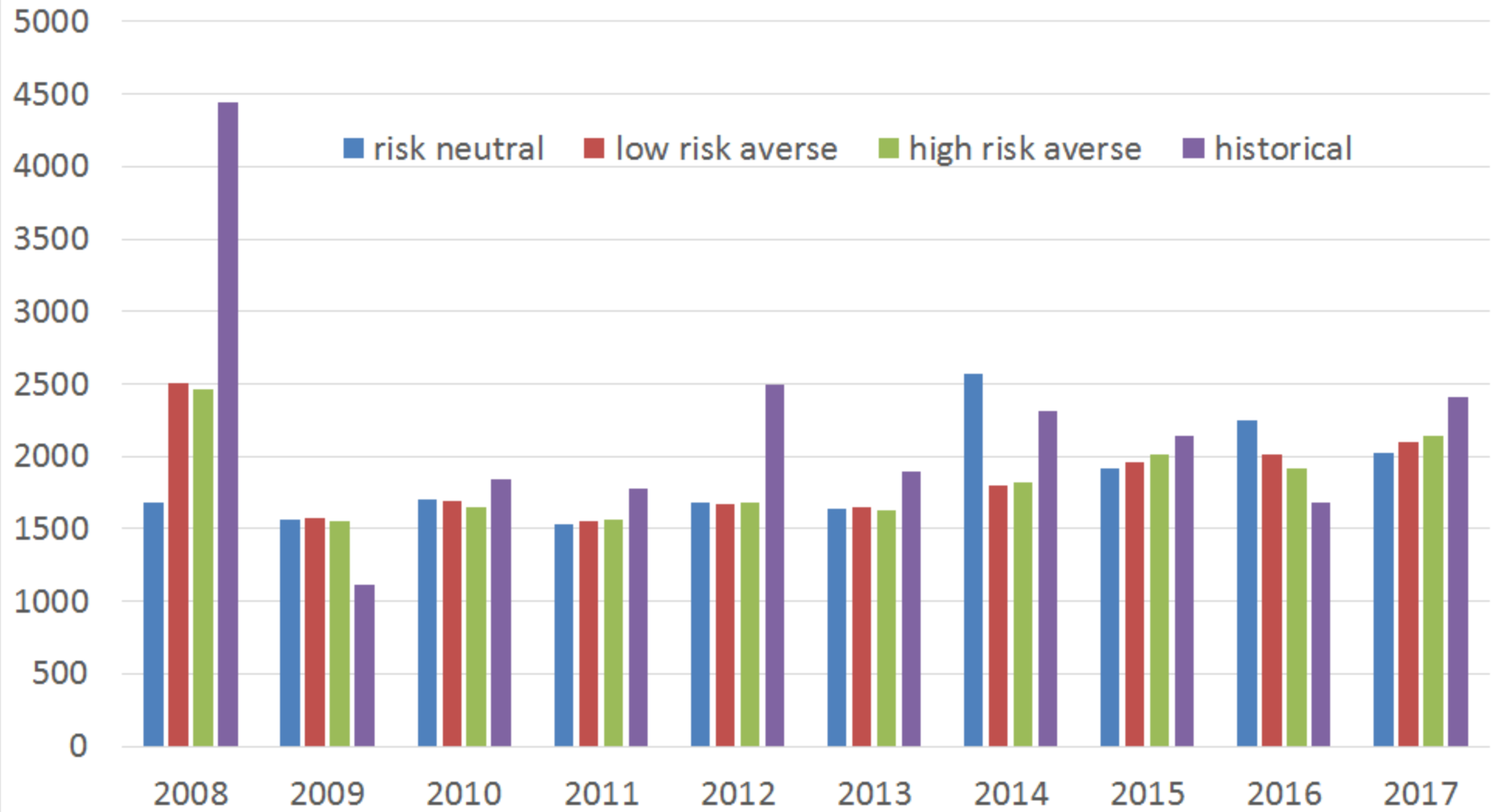




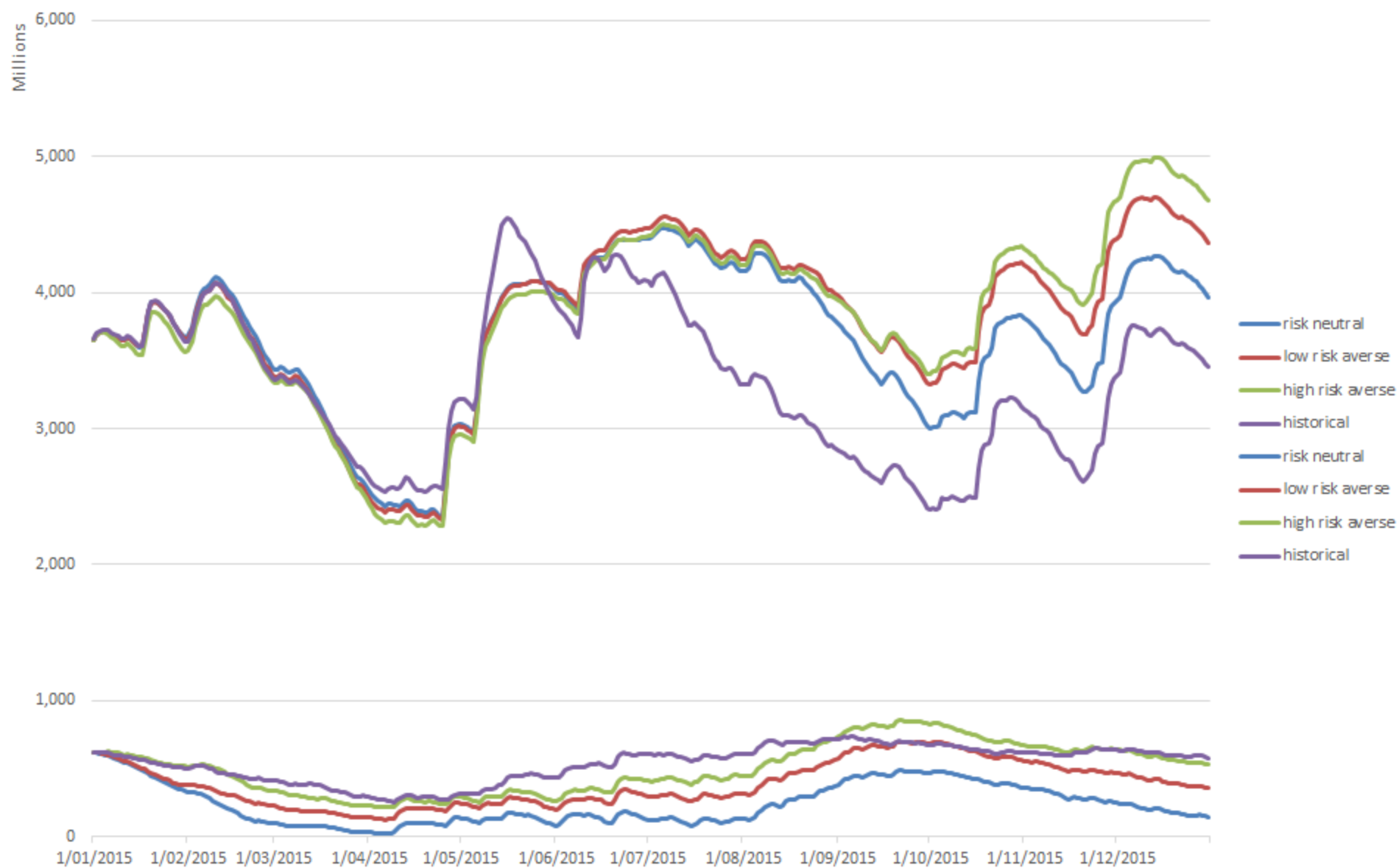
Simulated variable costs (\$M) assuming low gas cost



Simulated Ricardian rents (\$M) assuming low gas cost



North Island and South Island storage in 2015



Ten-year simulation results

	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	3,768	346	36,785	209,449	70,298	279,747	102.9	100.4	48.1
historical	4,295	333	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-527	13	36,666	1,498	-8,190	-6,692	30.1	28.4	-20.5

(a) Risk neutral

	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	3,886	396	208	207,720	72,515	280,235	70.9	69.5	51.9
historical	4,295	388	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-410	7	89	-231	-5,973	-6,205	-1.9	-2.6	-16.7

(b) Low risk aversion

	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	4,001	419	210	205,725	74,826	280,551	68.5	67.5	51.1
historical	4,295	433	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-294	-14	91	-2,226	-3,662	-5,888	-4.3	-4.6	-17.5

(c) High risk aversion

	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	3,768	346	36,785	209,449	70,298	279,747	102.9	100.4	48.1
historical	4,295	333	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-527	13	36,666	1,498	-8,190	-6,692	30.1	28.4	-20.5

(a) Risk neutral

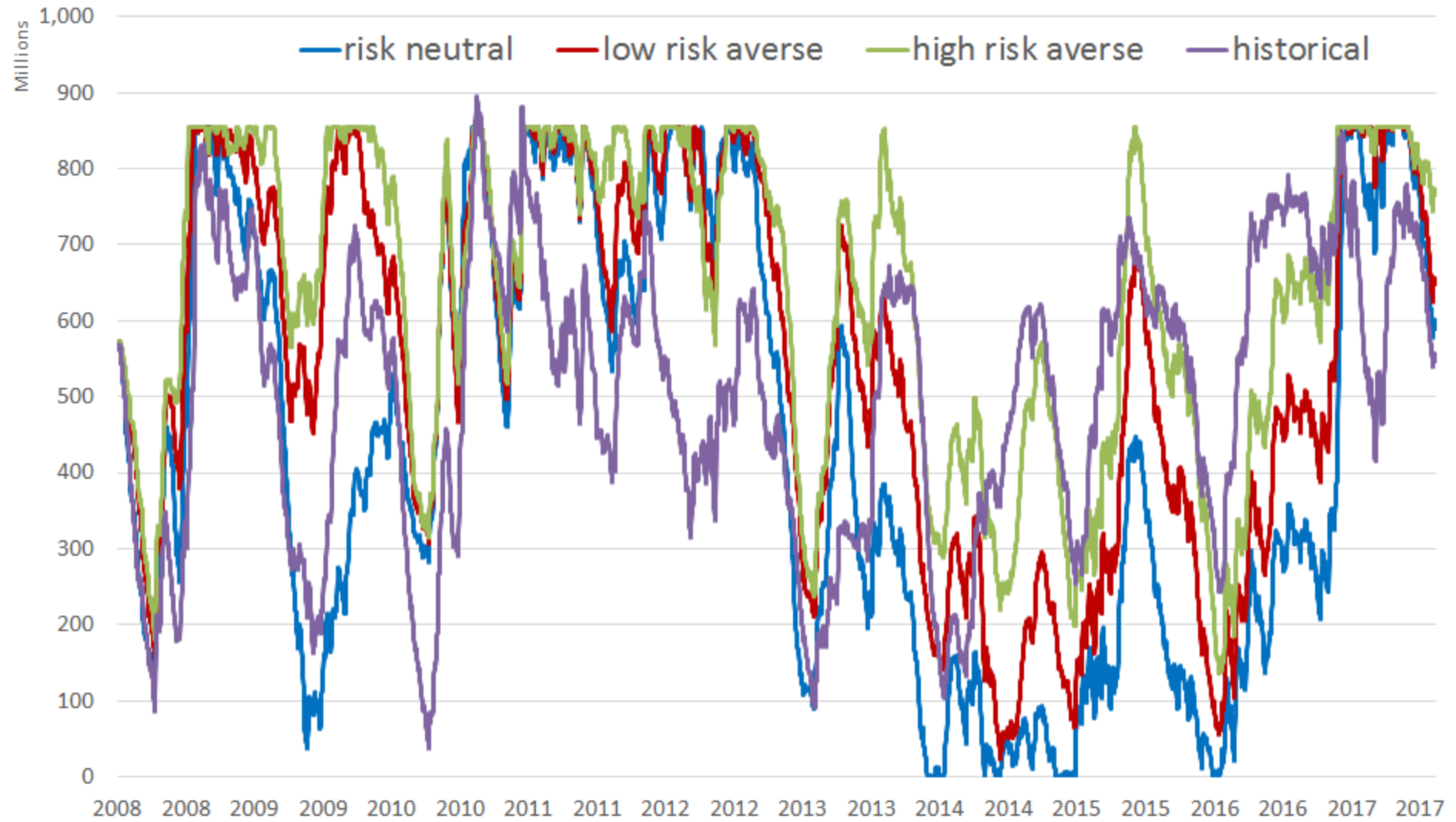
	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
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difference	-410	7	89	-231	-5,973	-6,205	-1.9	-2.6	-16.7

(b) Low risk aversion

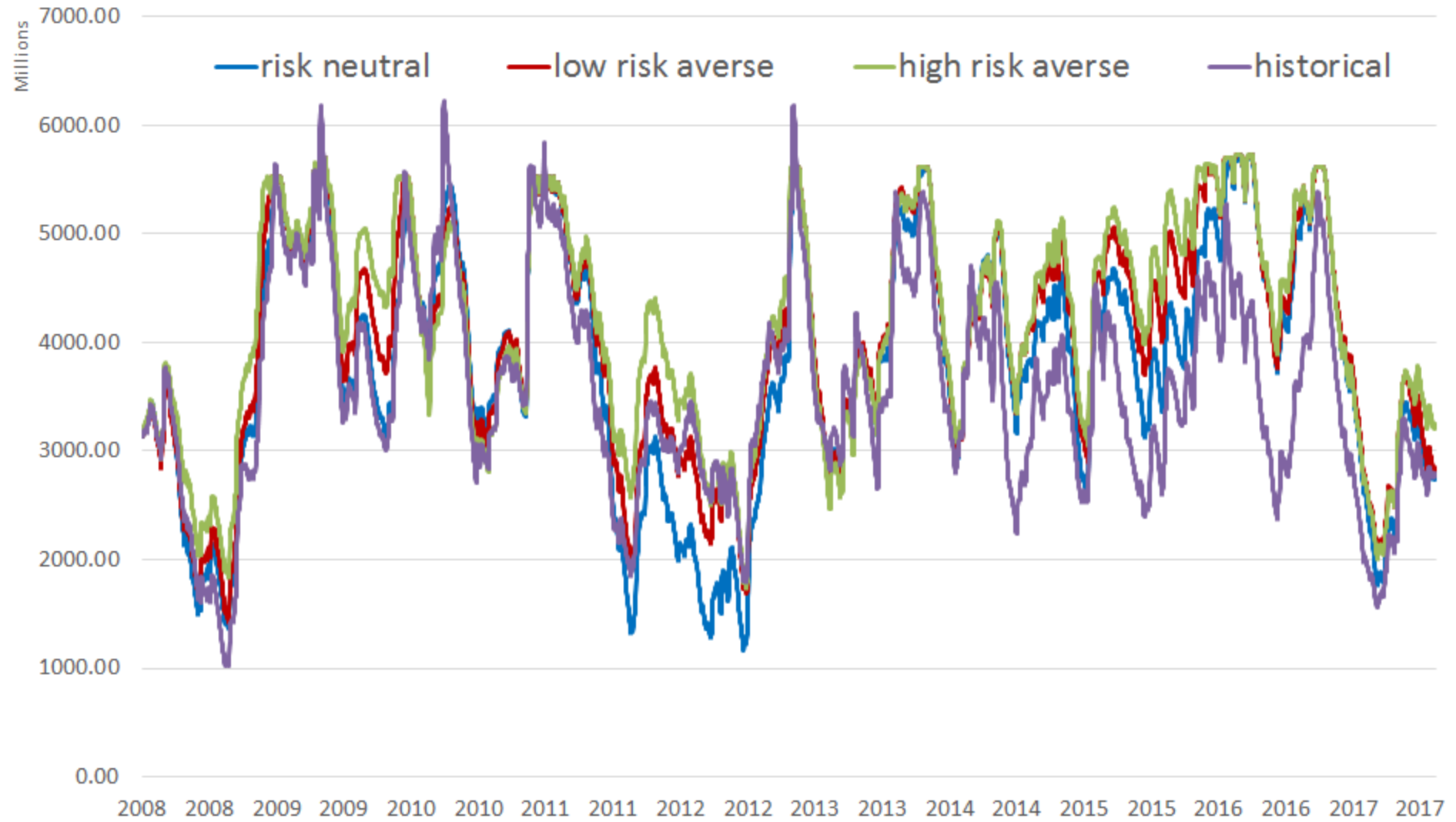
	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	4,001	419	210	205,725	74,826	280,551	68.5	67.5	51.1
historical	4,295	433	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-294	-14	91	-2,226	-3,662	-5,888	-4.3	-4.6	-17.5

(c) High risk aversion

North Island Storage (MBIE fuel costs)

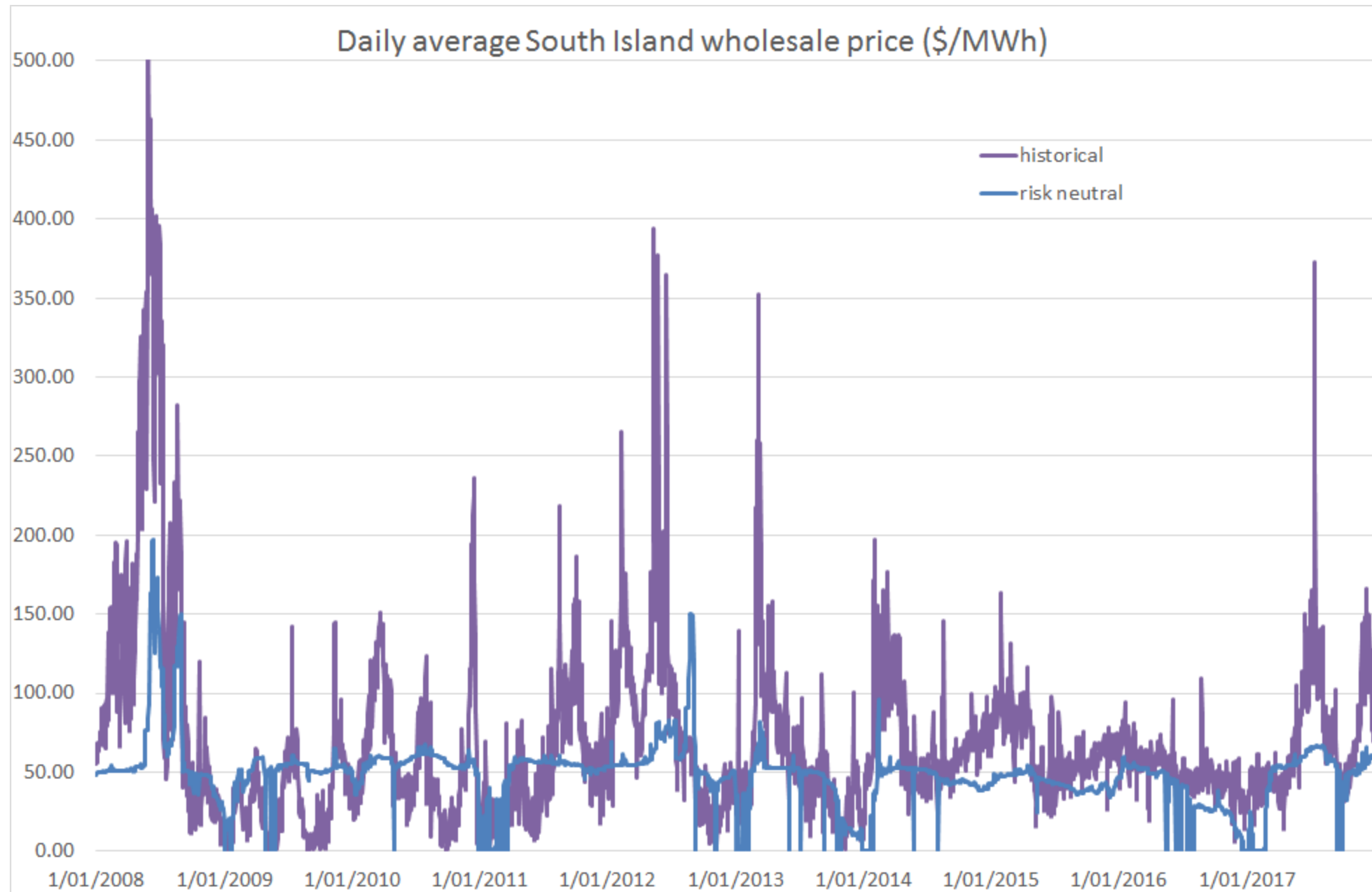


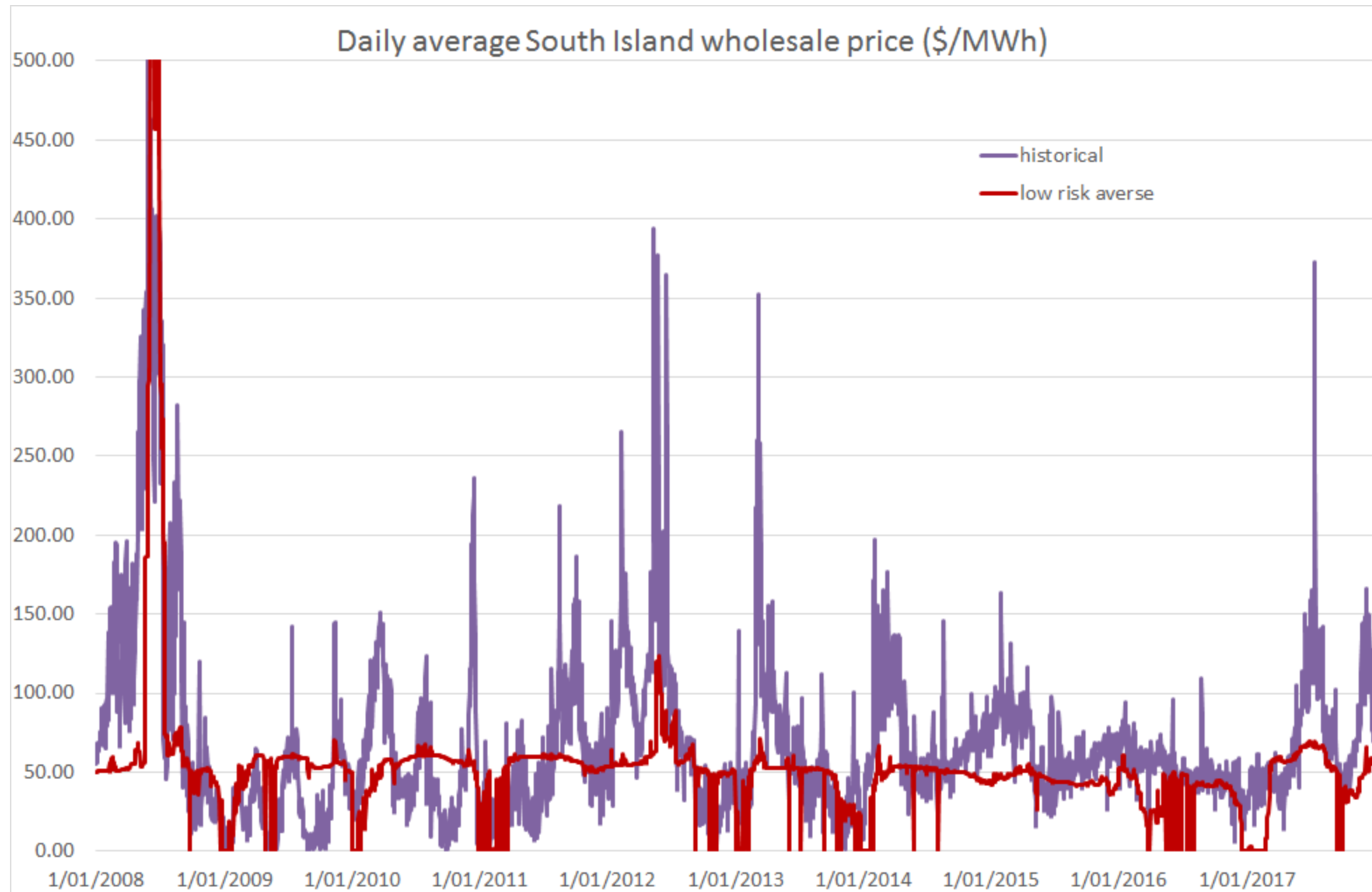
South Island Storage (MBIE fuel costs)

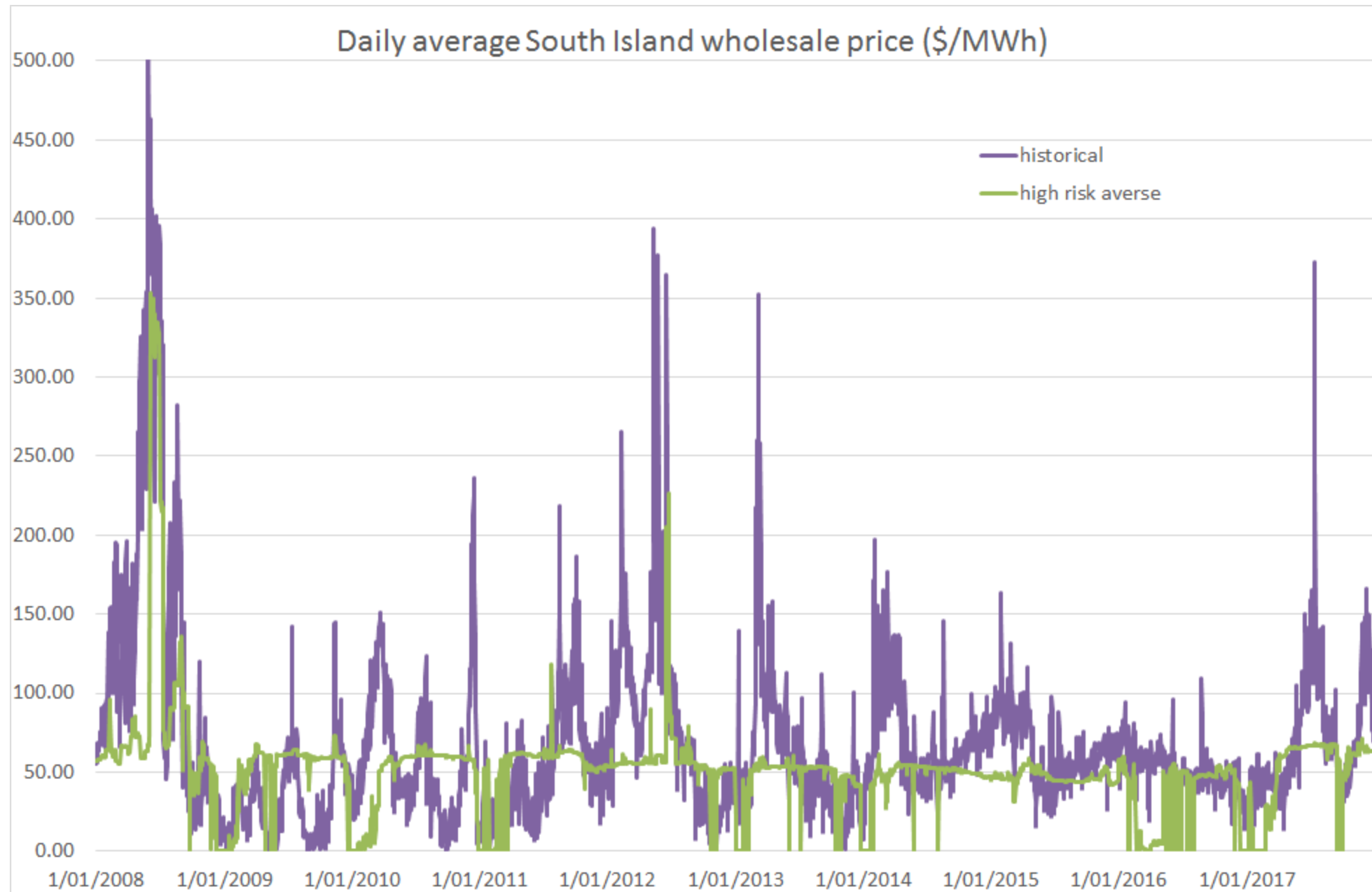


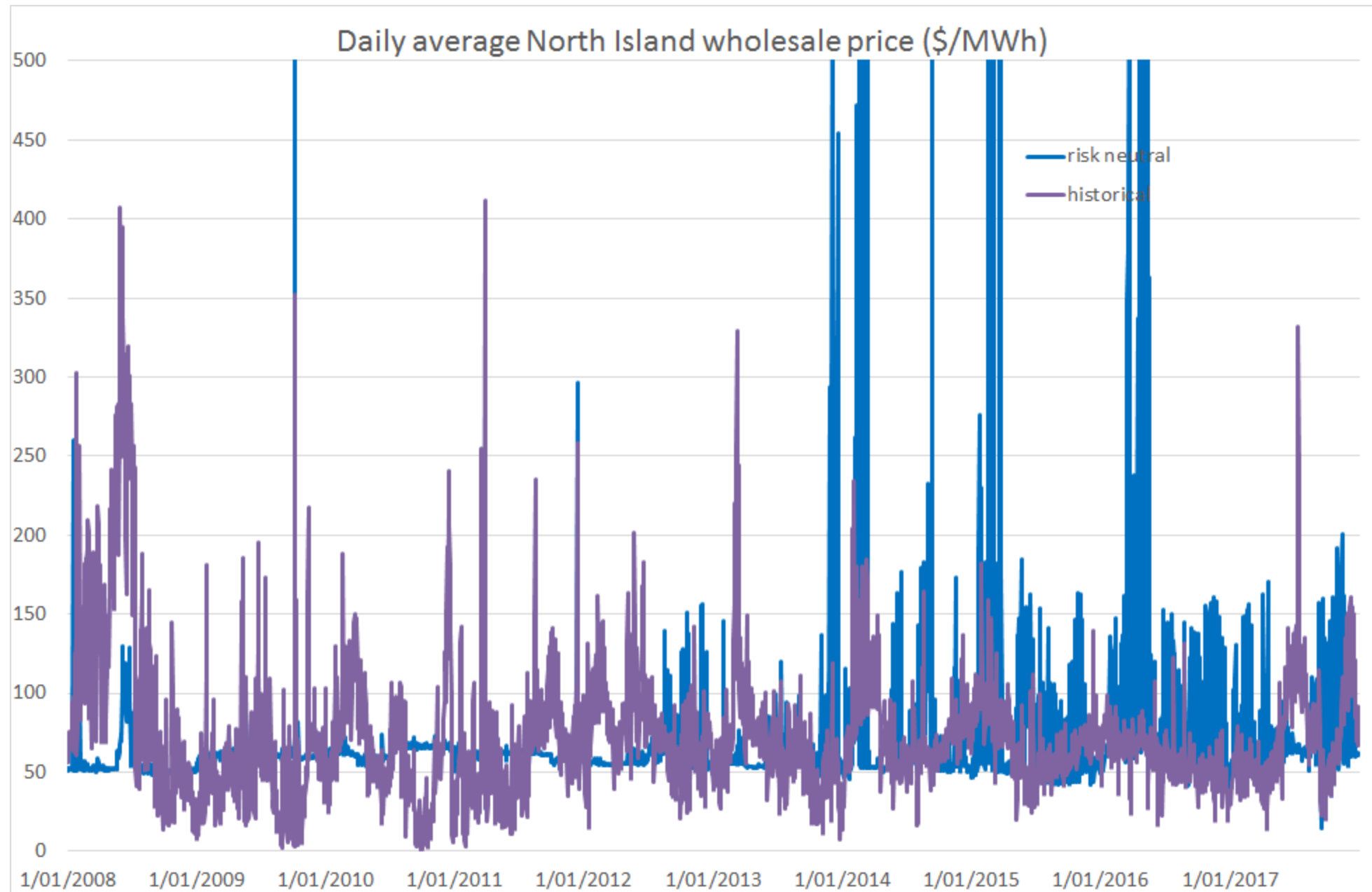
(2015 \$M)	risk neutral	low risk averse	high risk averse	historical
Revenue	28,251	22,485	21,864	26,409
Cost	3,768	3,886	4,001	4,295
Rent	24,483	18,599	17,863	22,114
Difference	2,369	-3,515	-4,251	0

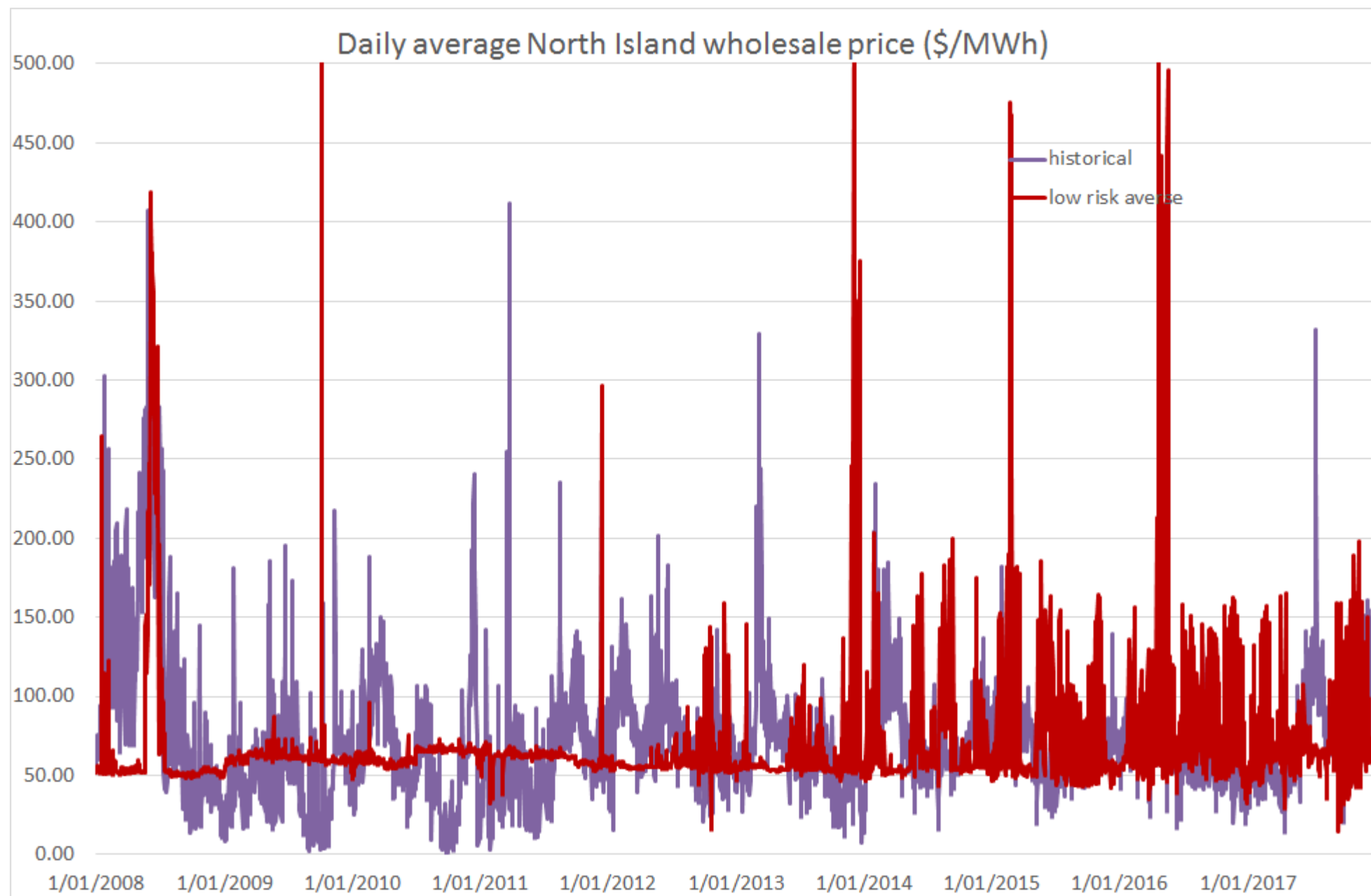
Extra Plots

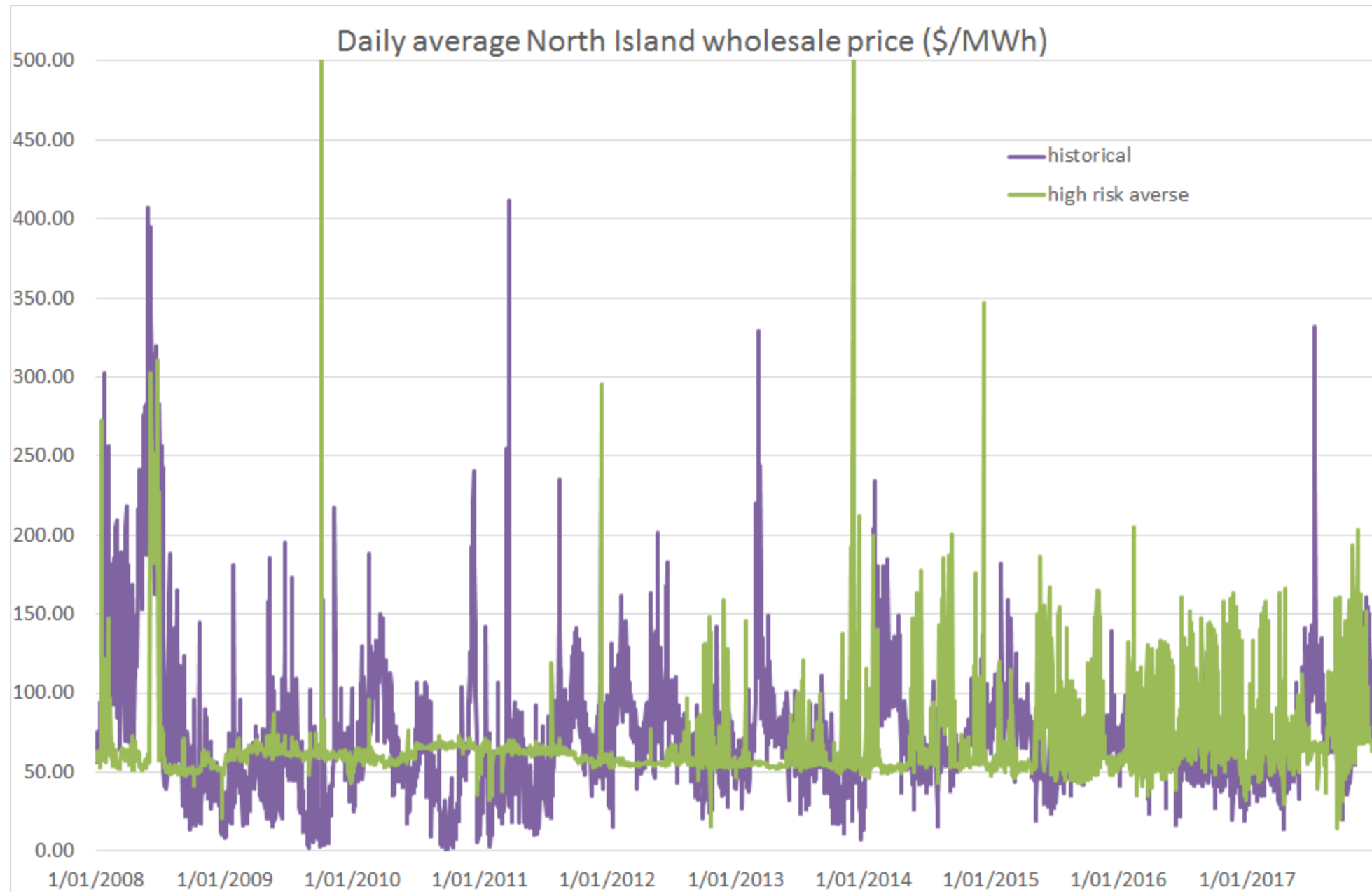






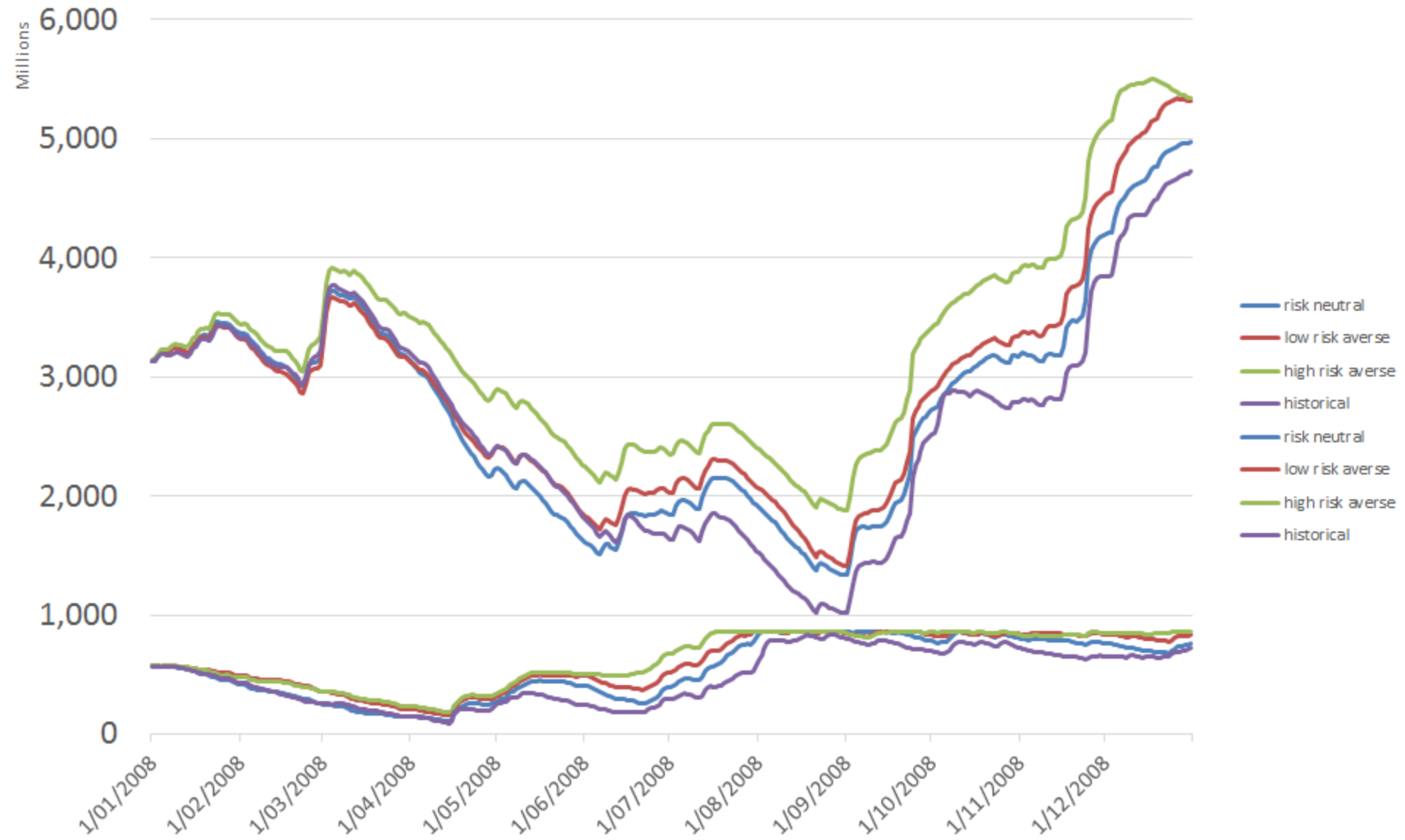




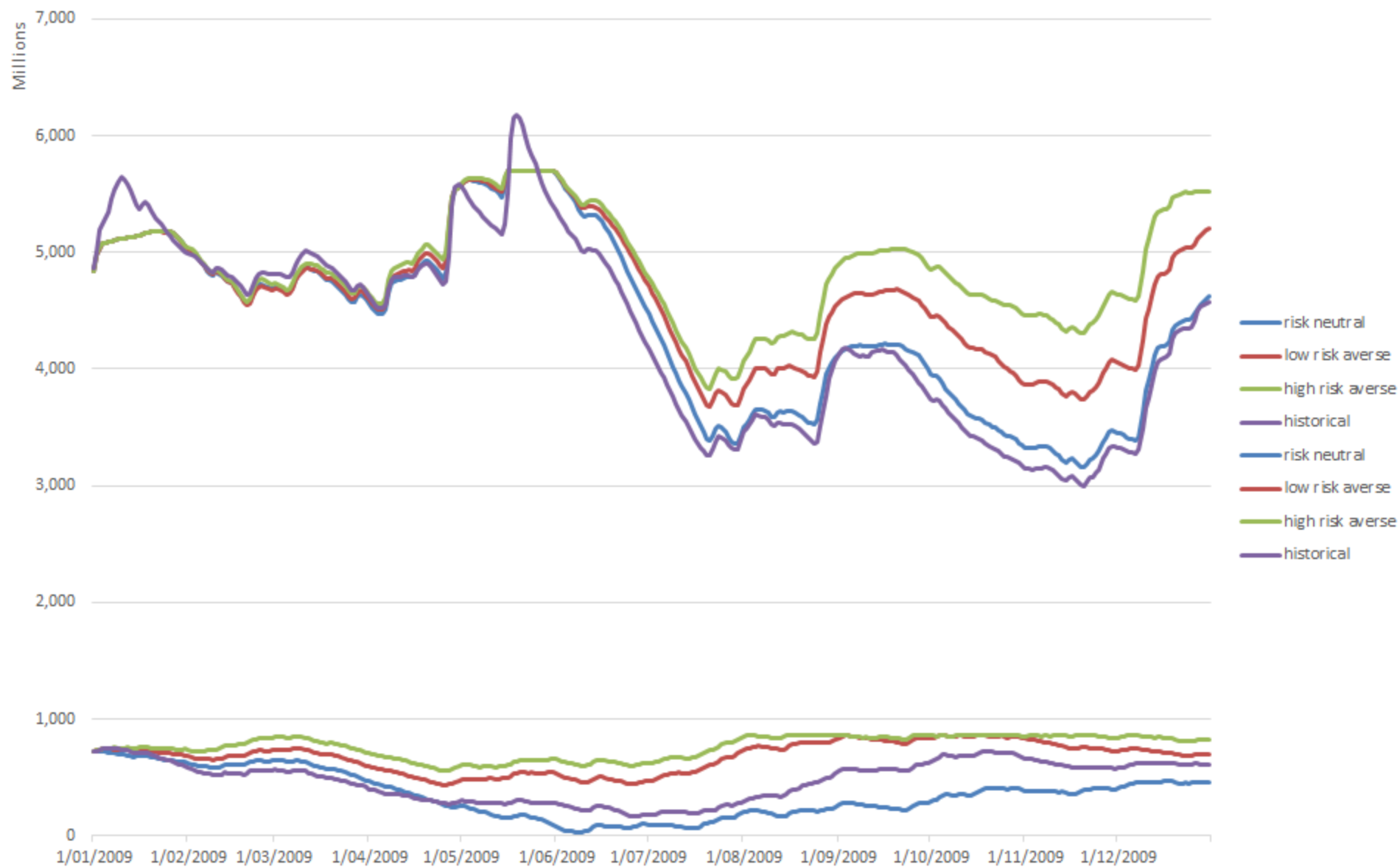


Storage

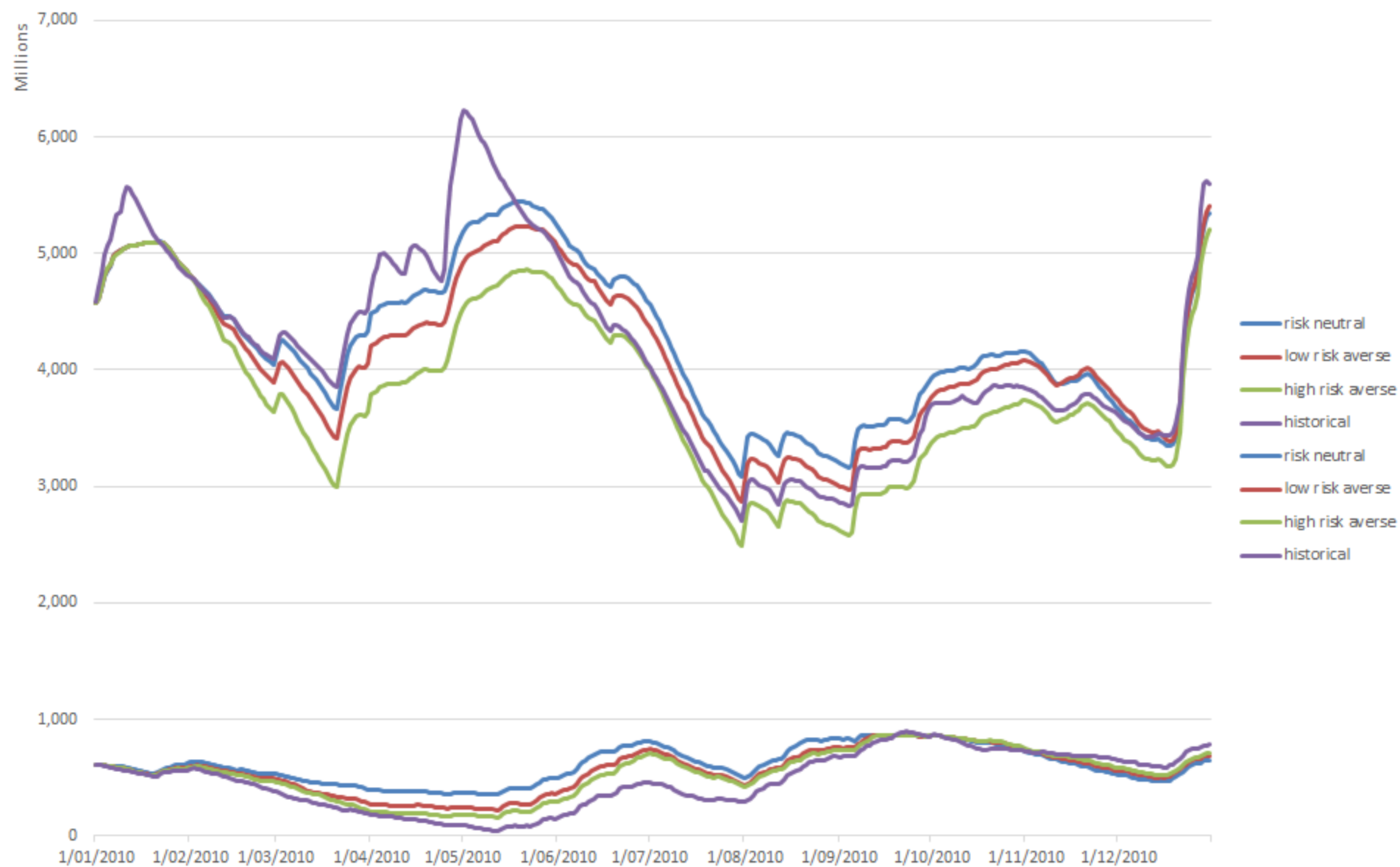
North Island and South Island storage in 2008



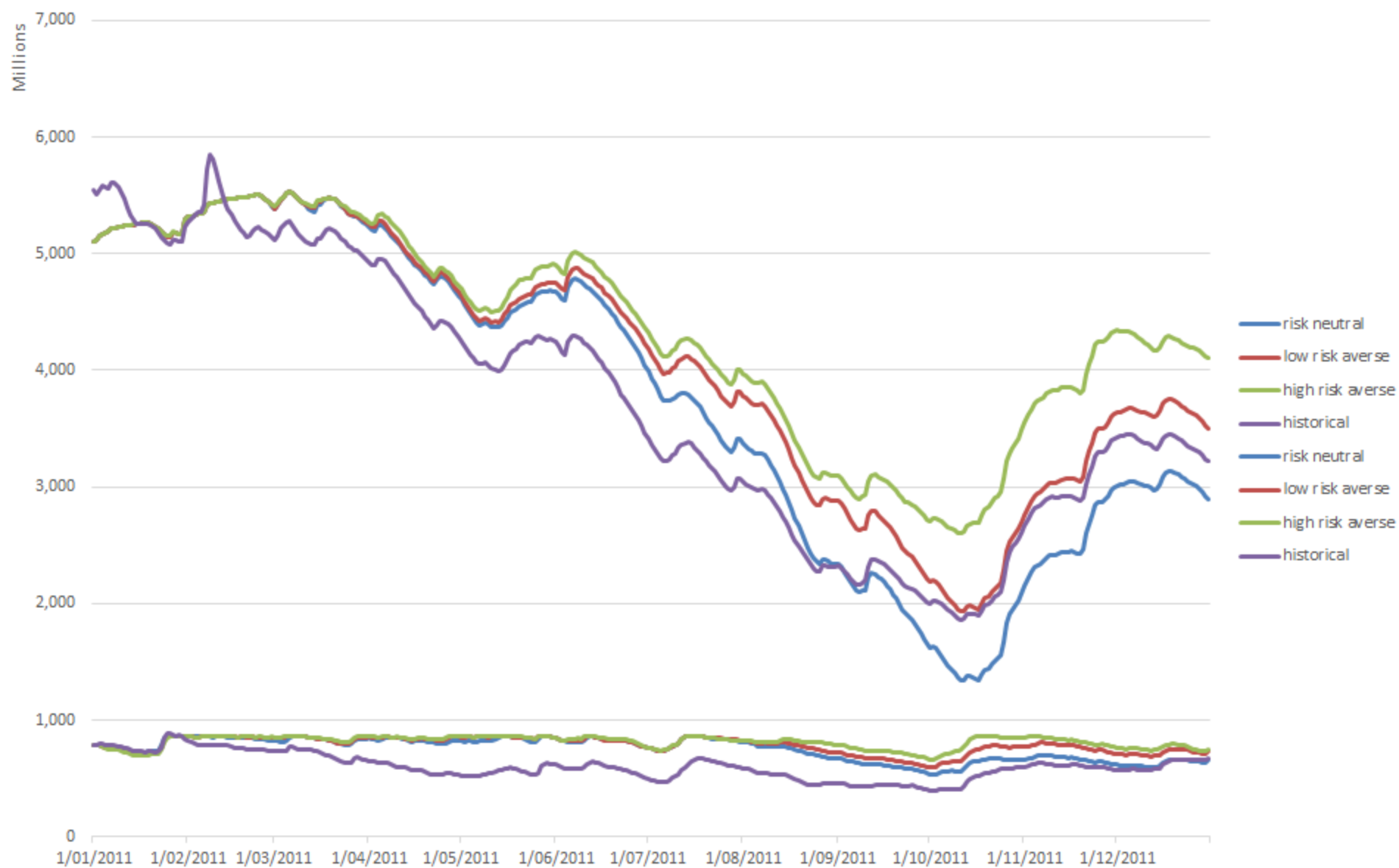
North Island and South Island storage in 2009



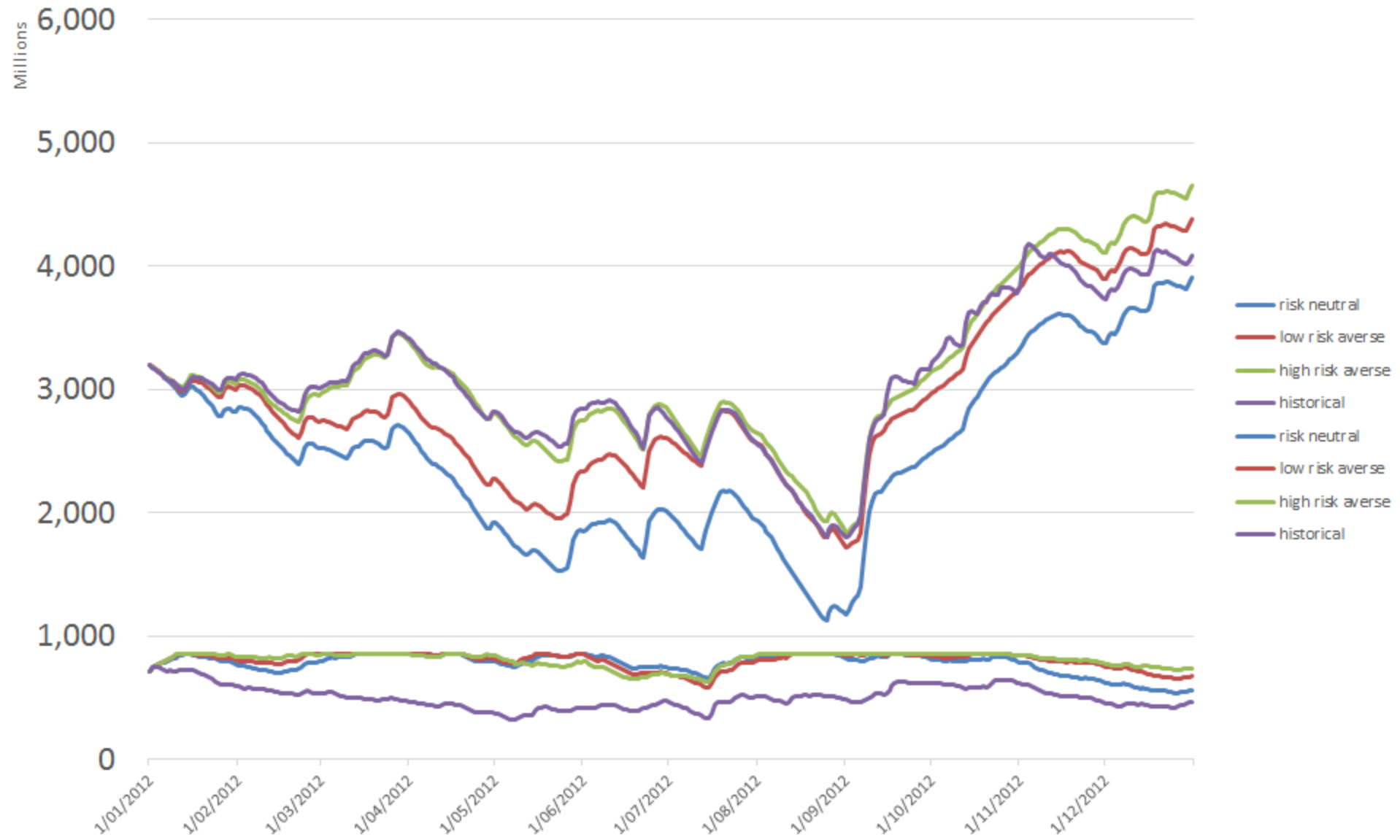
North Island and South Island storage in 2010



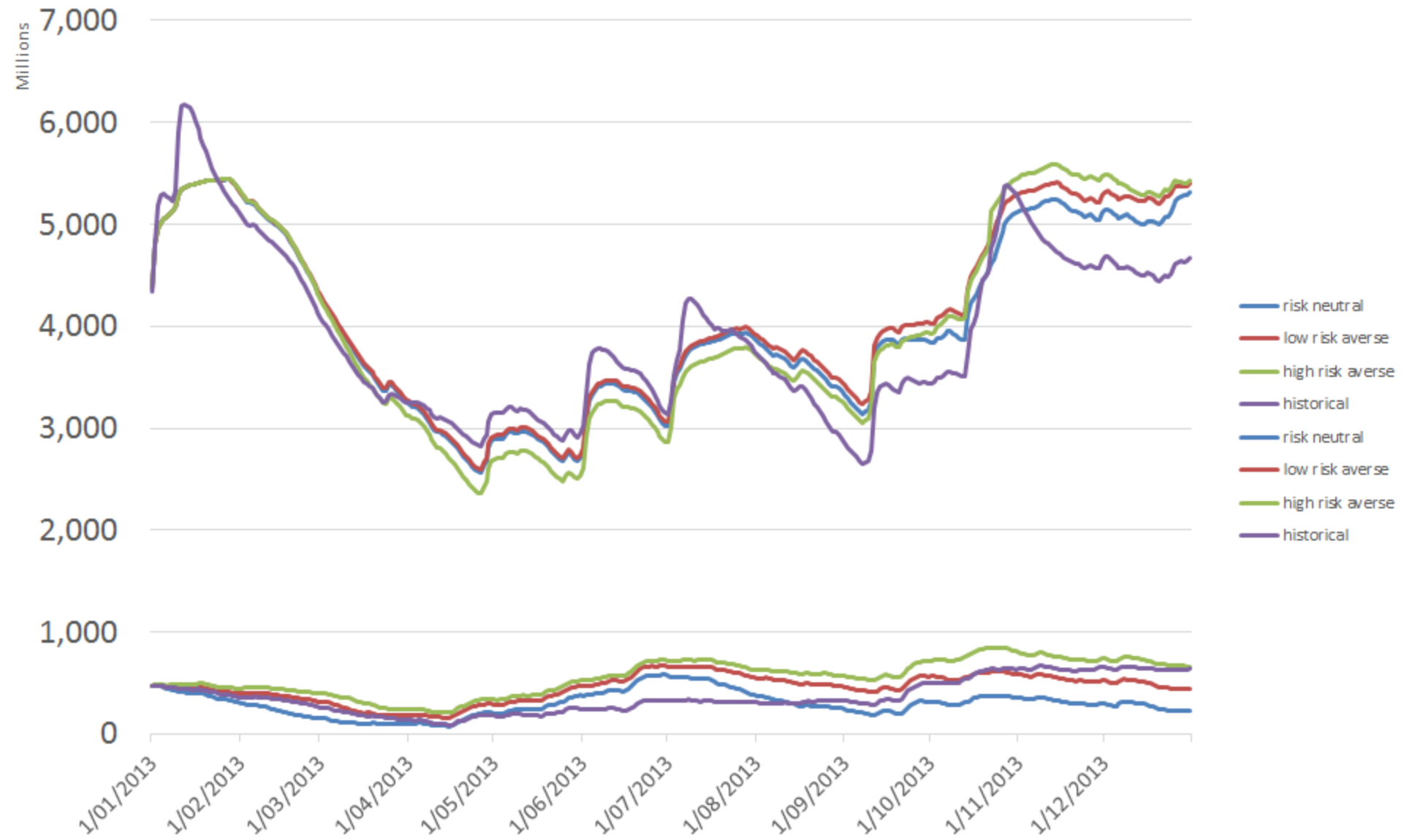
North Island and South Island storage in 2011



North Island and South Island storage in 2012



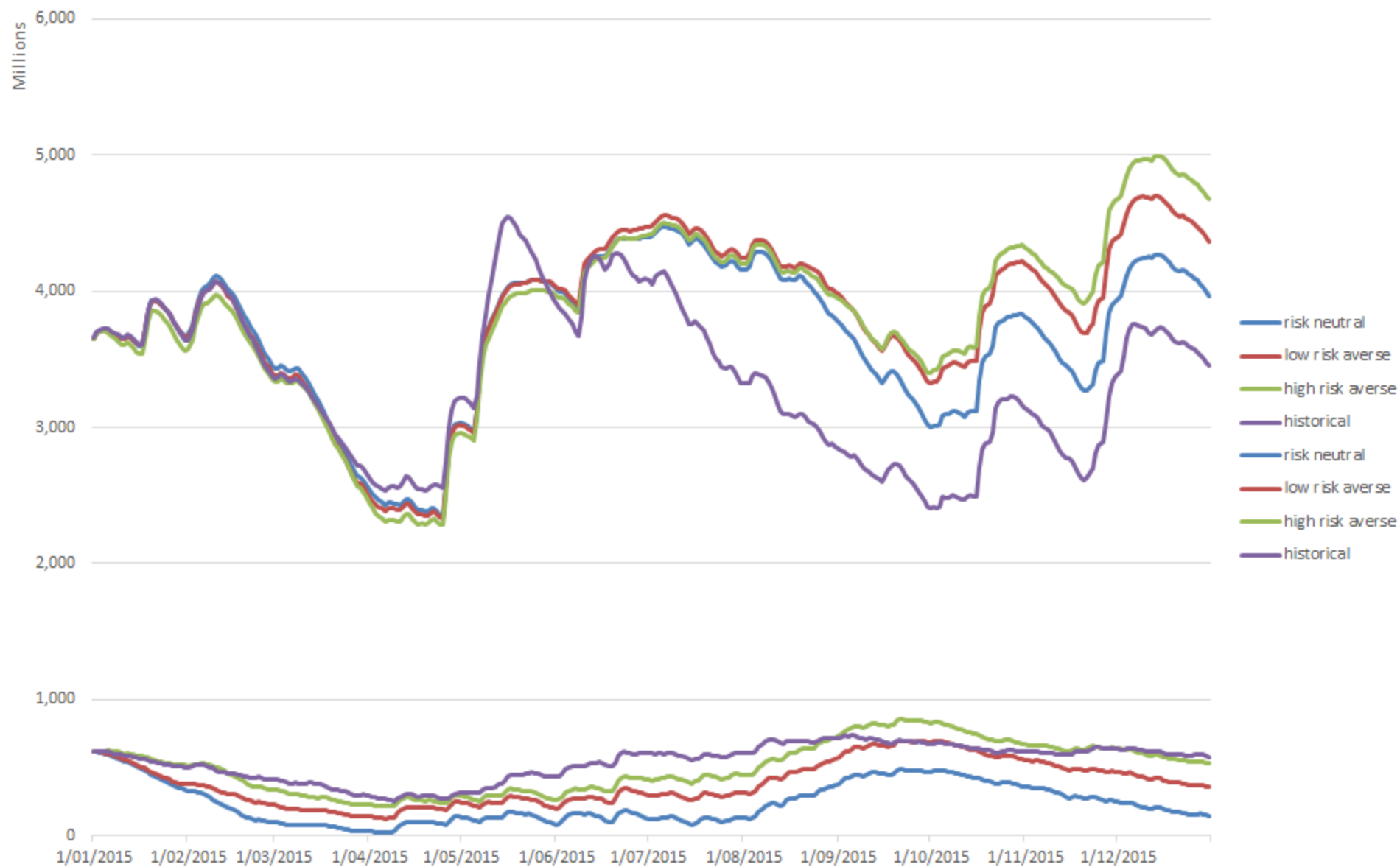
North Island and South Island storage in 2013



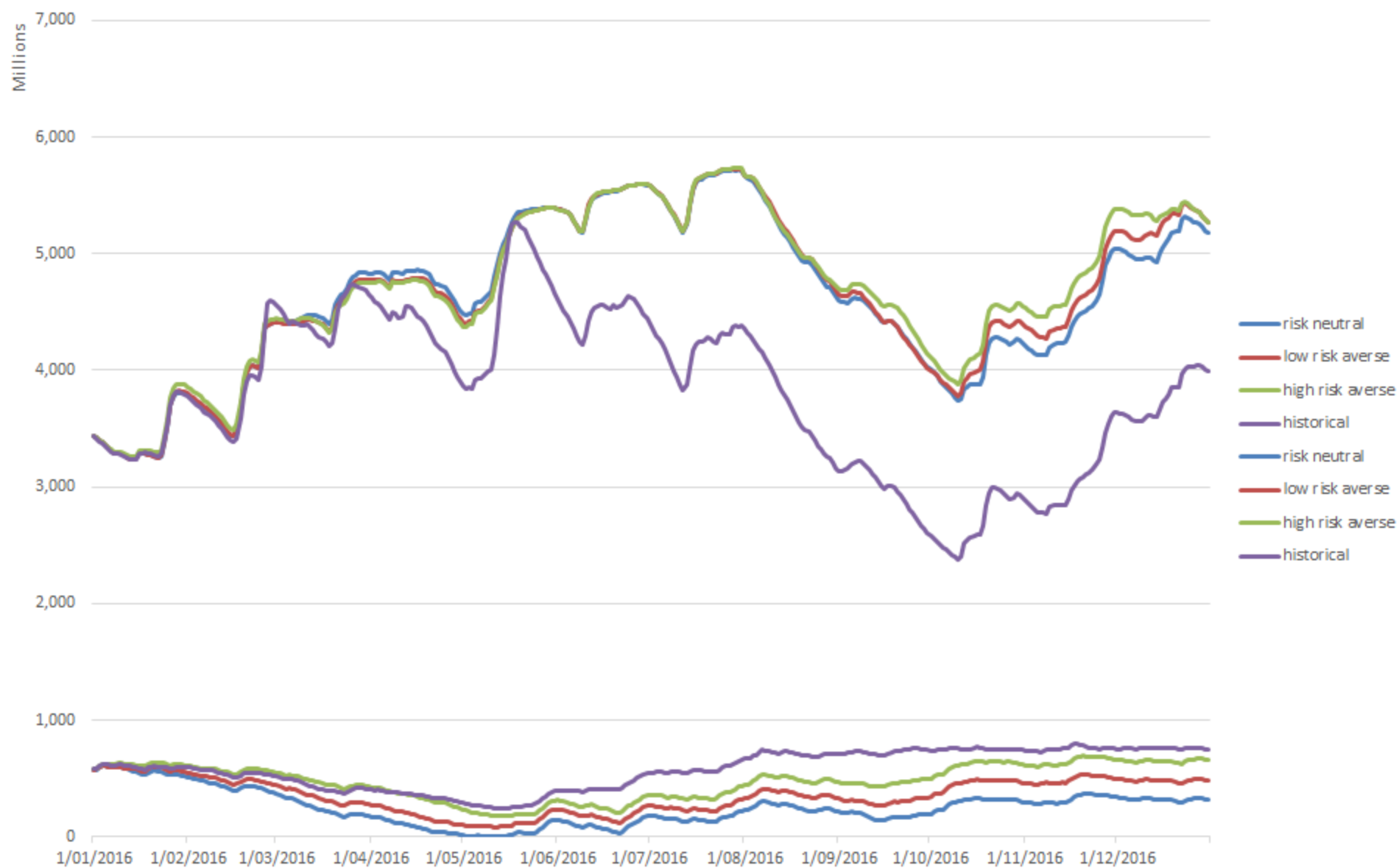
North Island and South Island storage in 2014



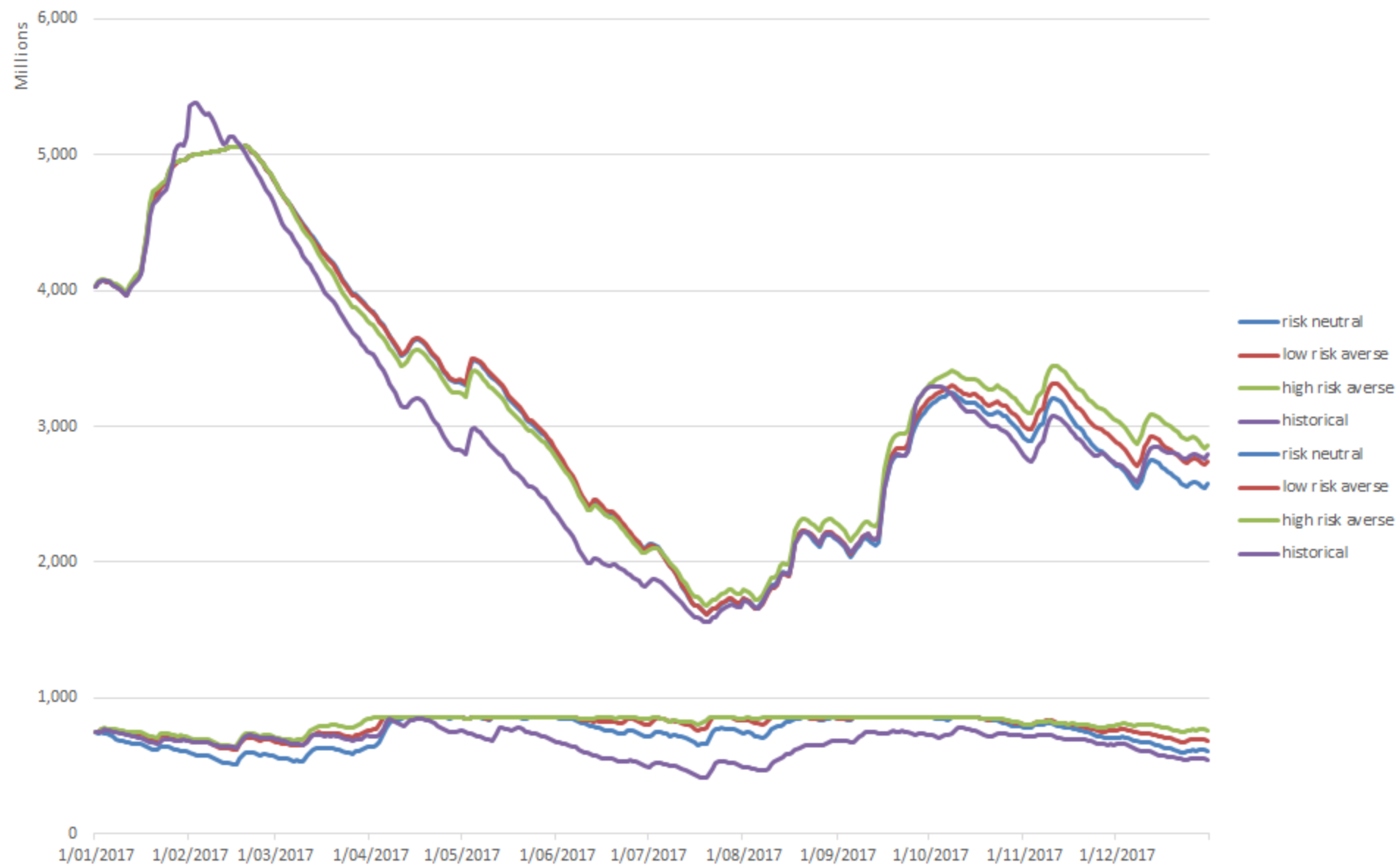
North Island and South Island storage in 2015



North Island and South Island storage in 2016

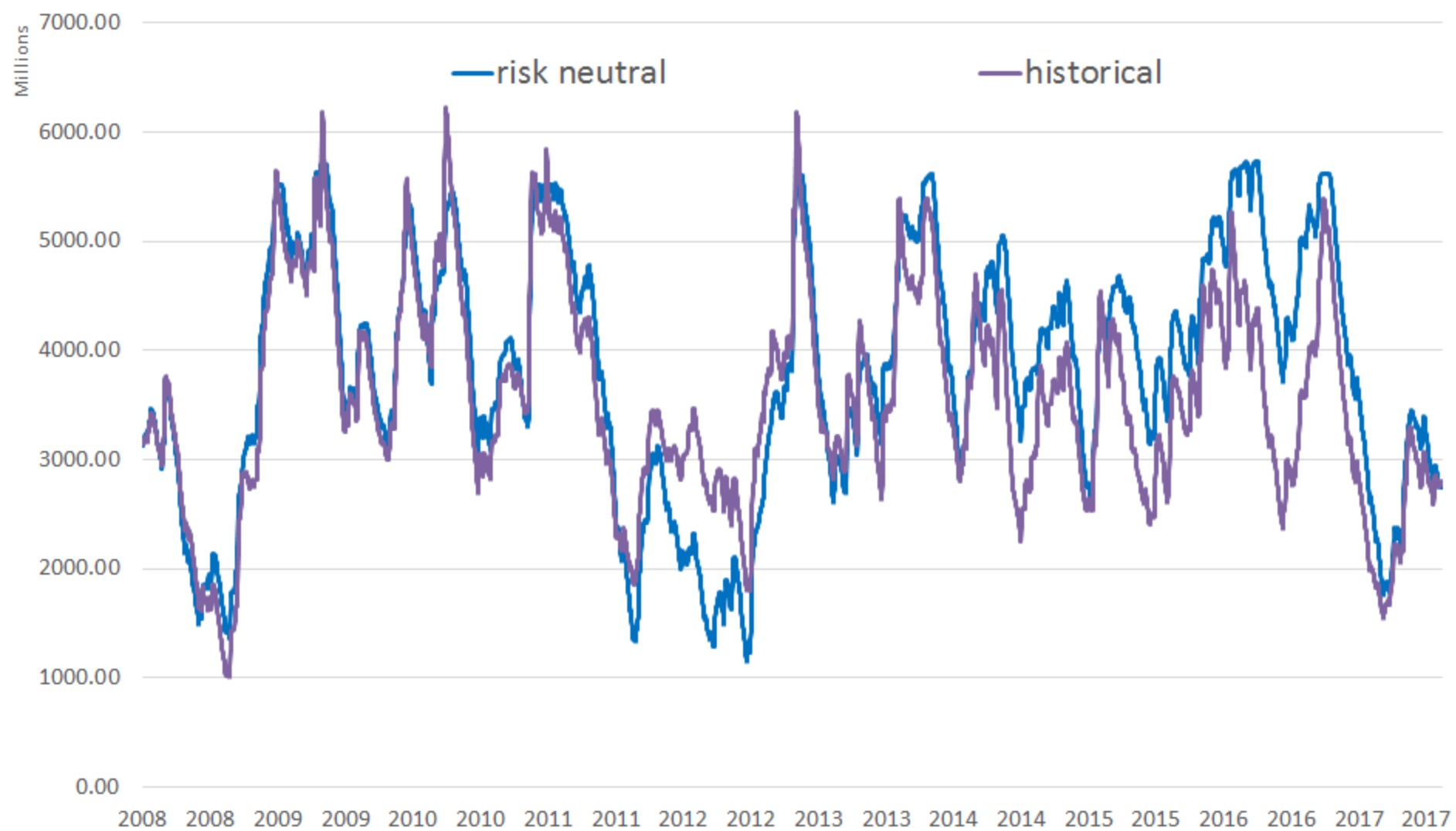


North Island and South Island storage in 2017

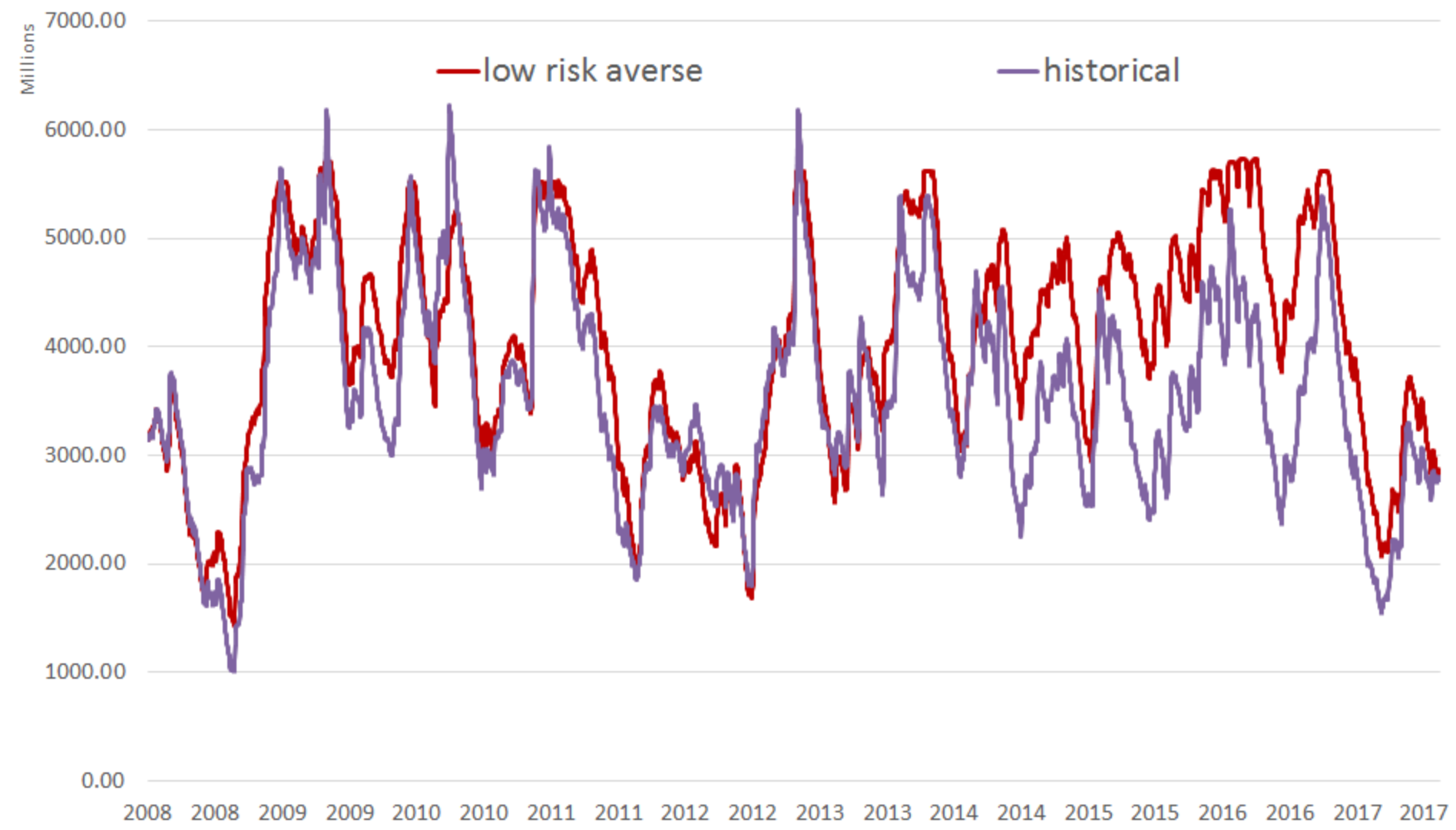


Extra ten-year simulation results
MBIE costs

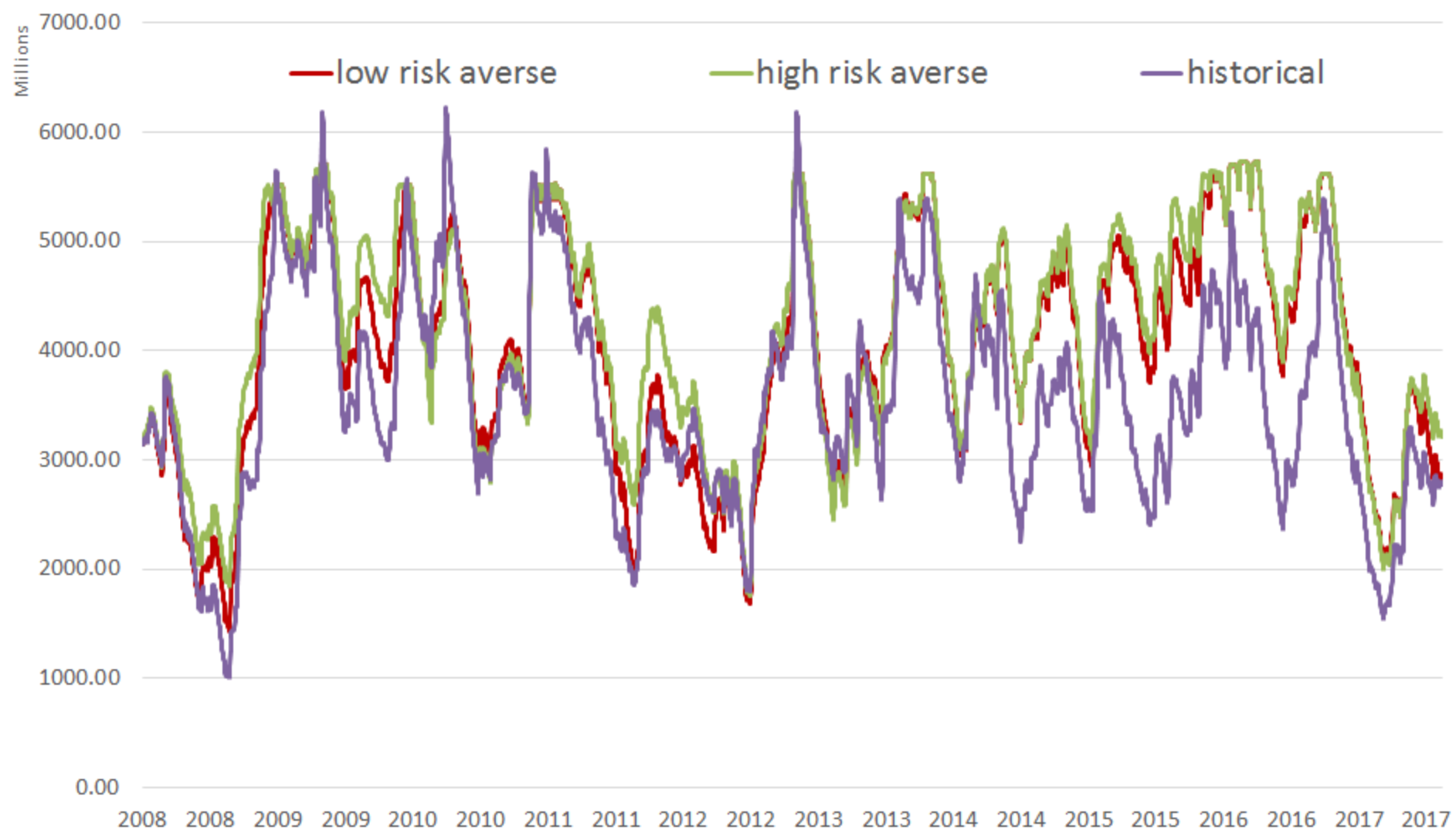
South Island Storage (MBIE fuel costs)



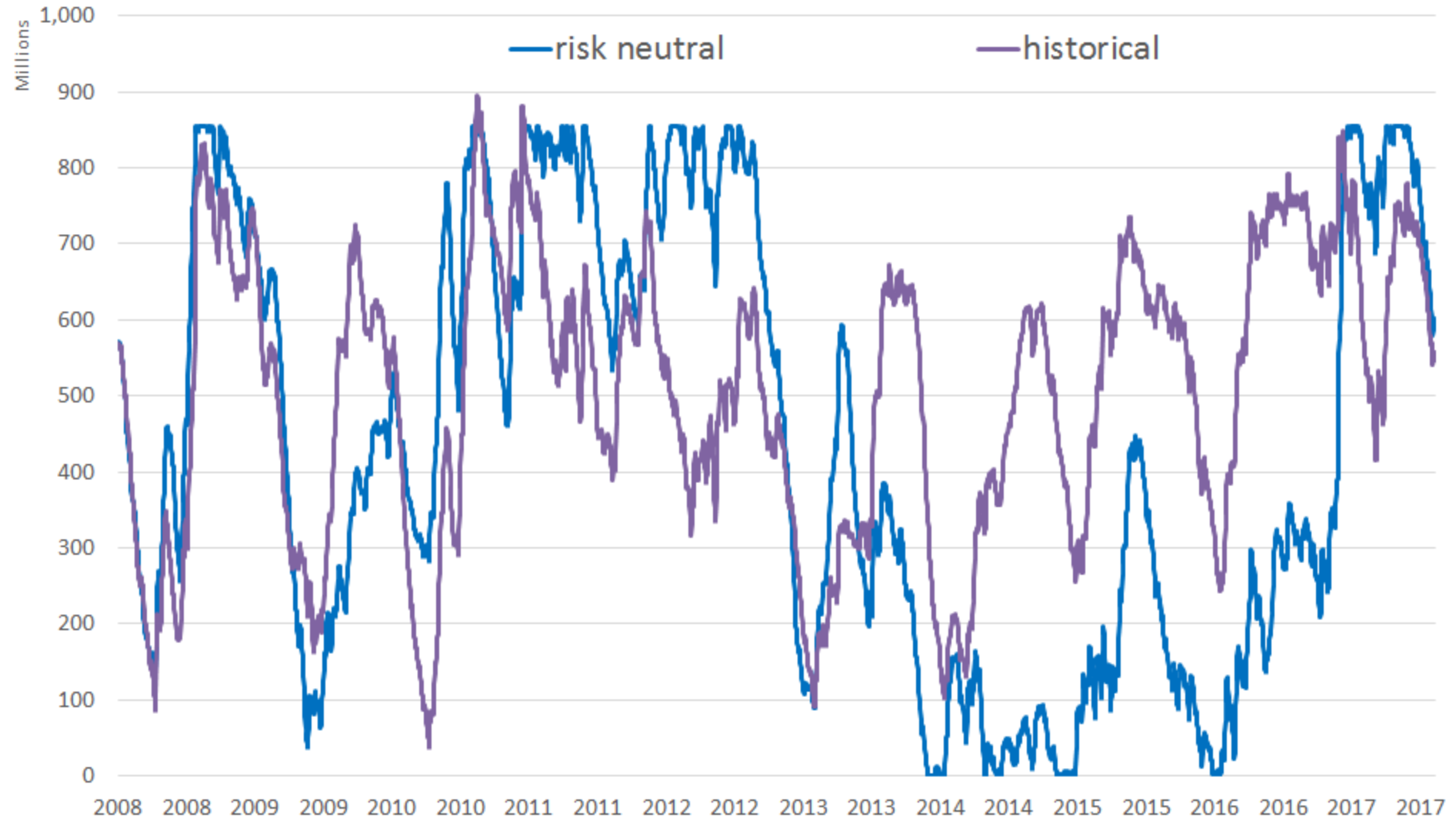
South Island Storage (MBIE fuel costs)



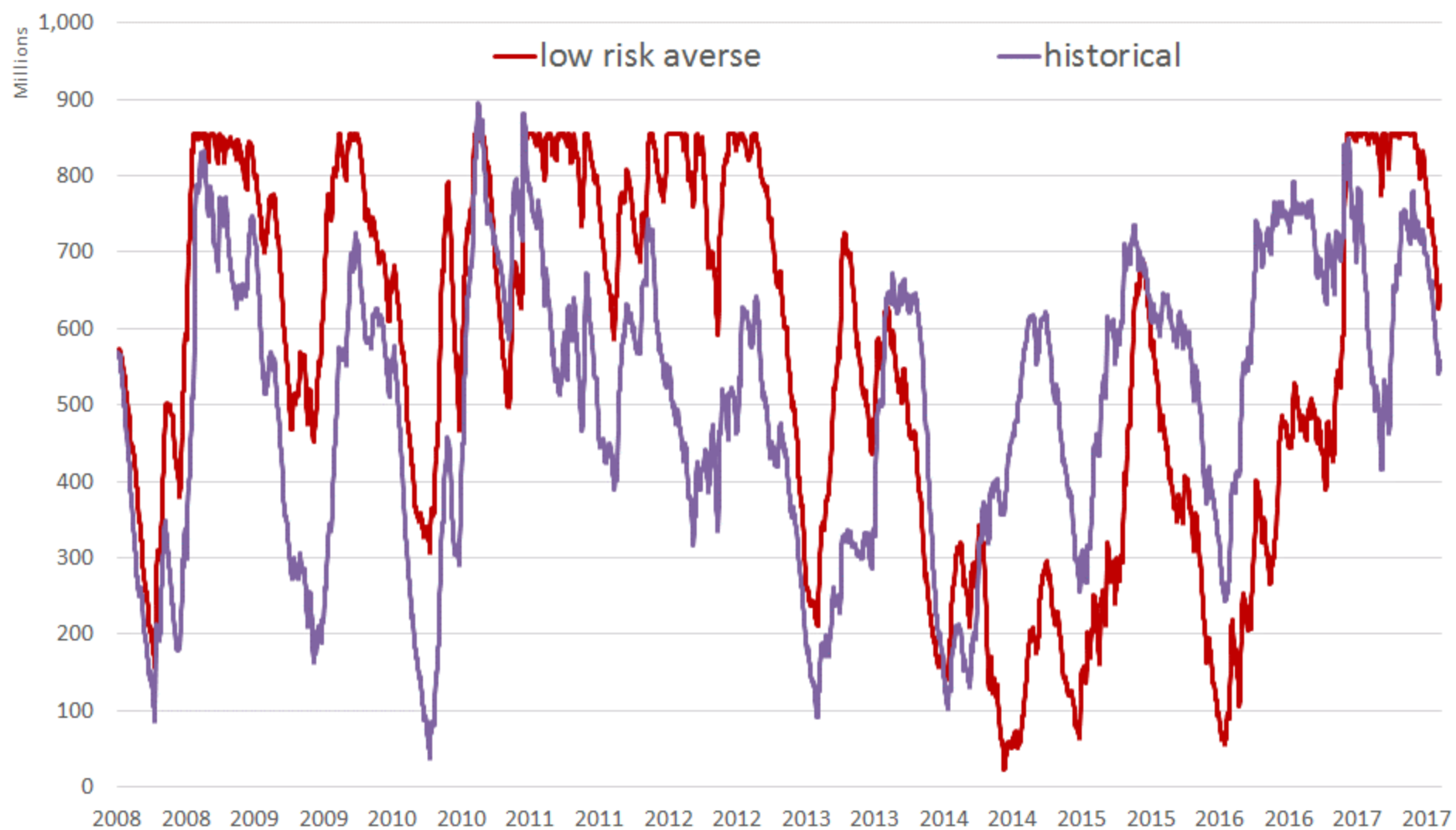
South Island Storage (MBIE fuel costs)



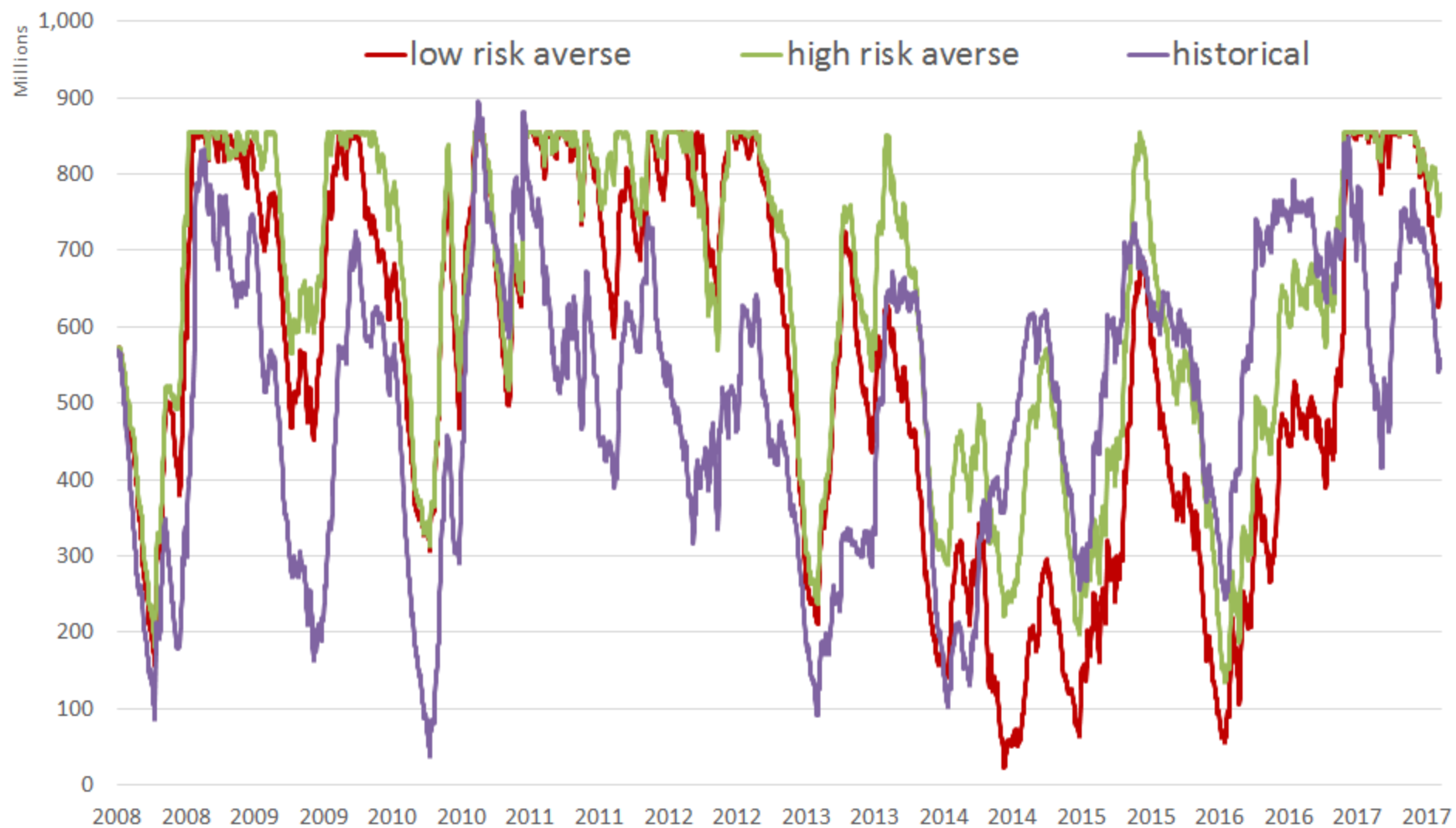
North Island Storage (MBIE fuel costs)



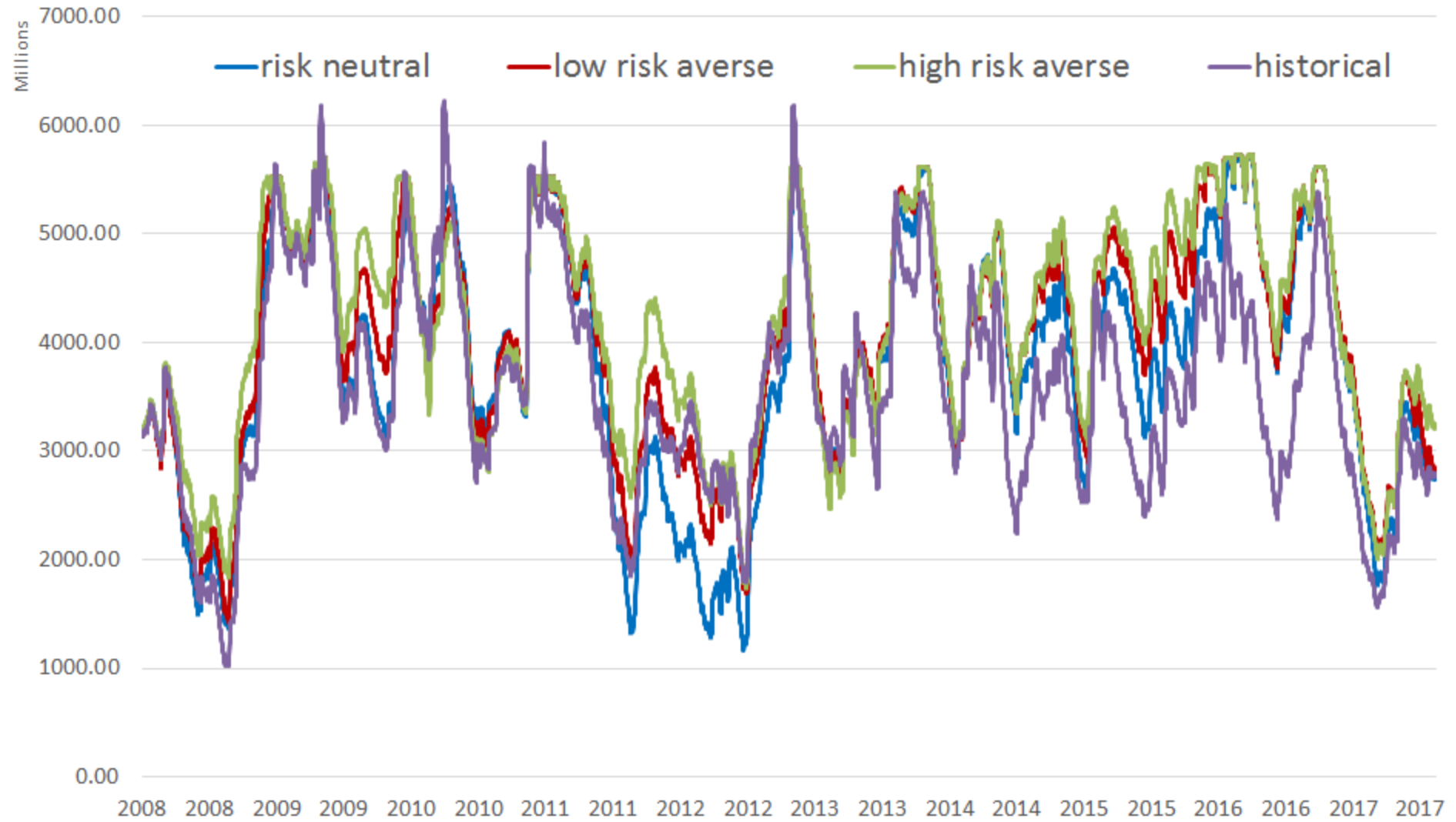
North Island Storage (MBIE fuel costs)



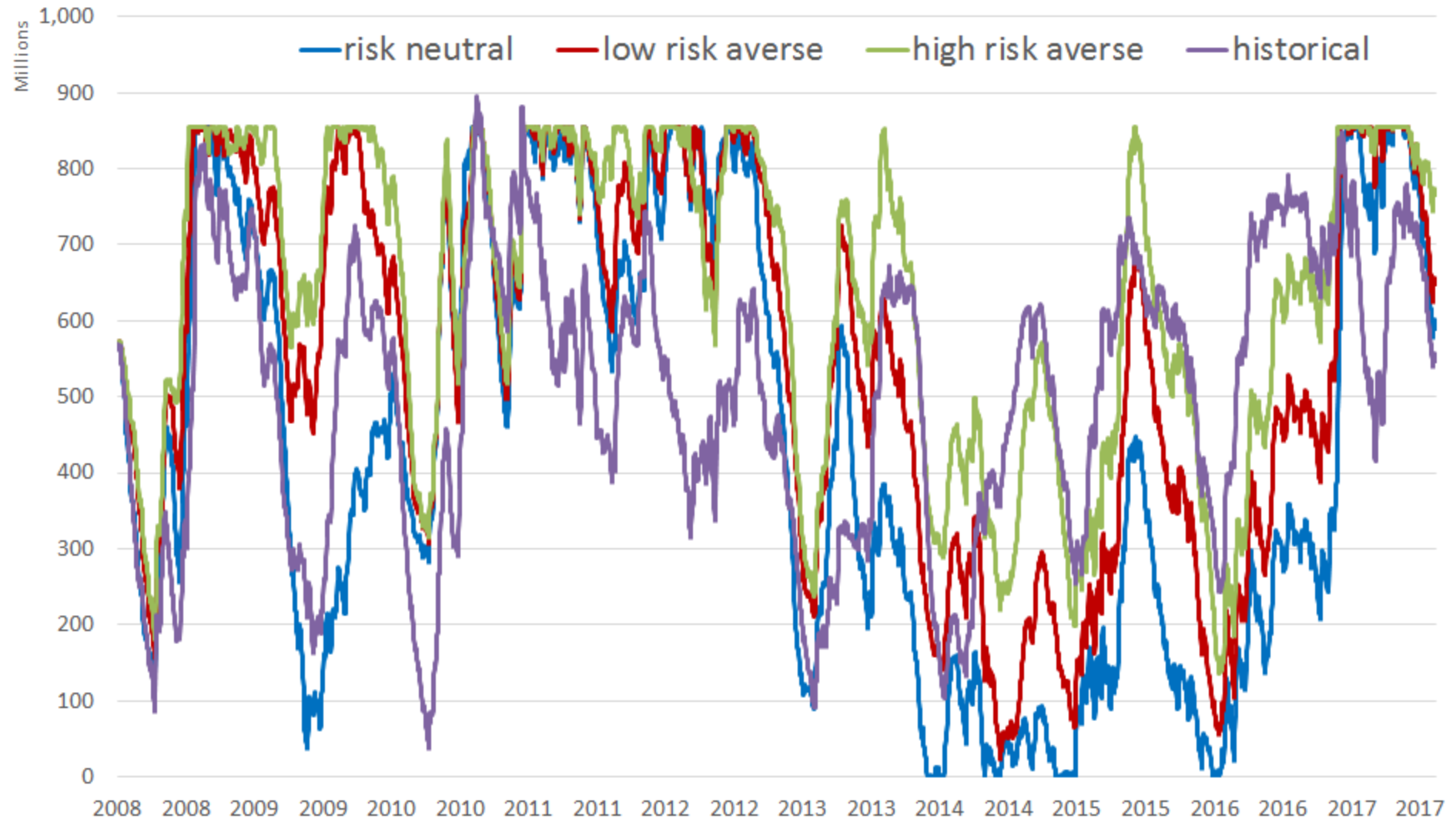
North Island Storage (MBIE fuel costs)

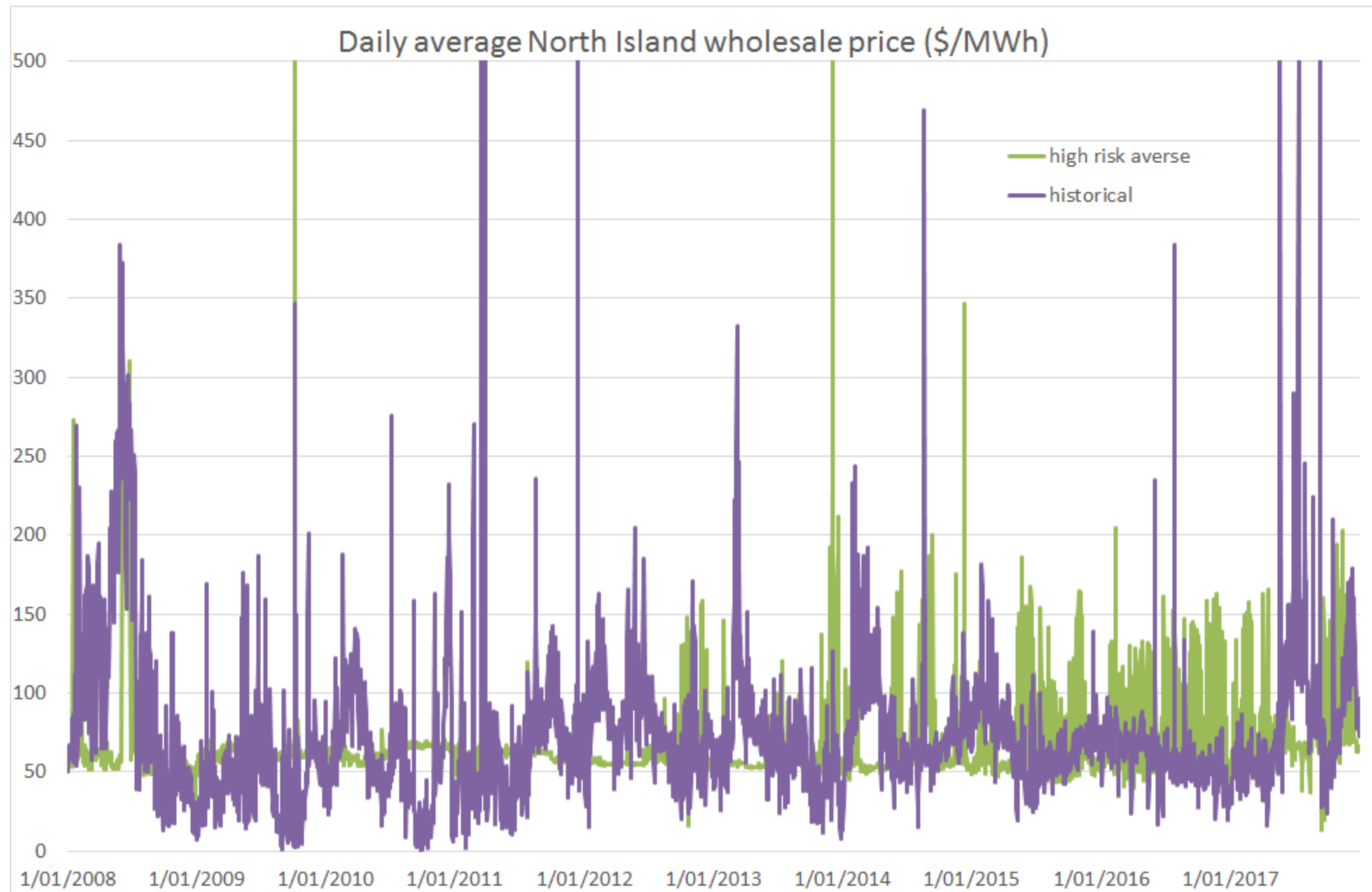


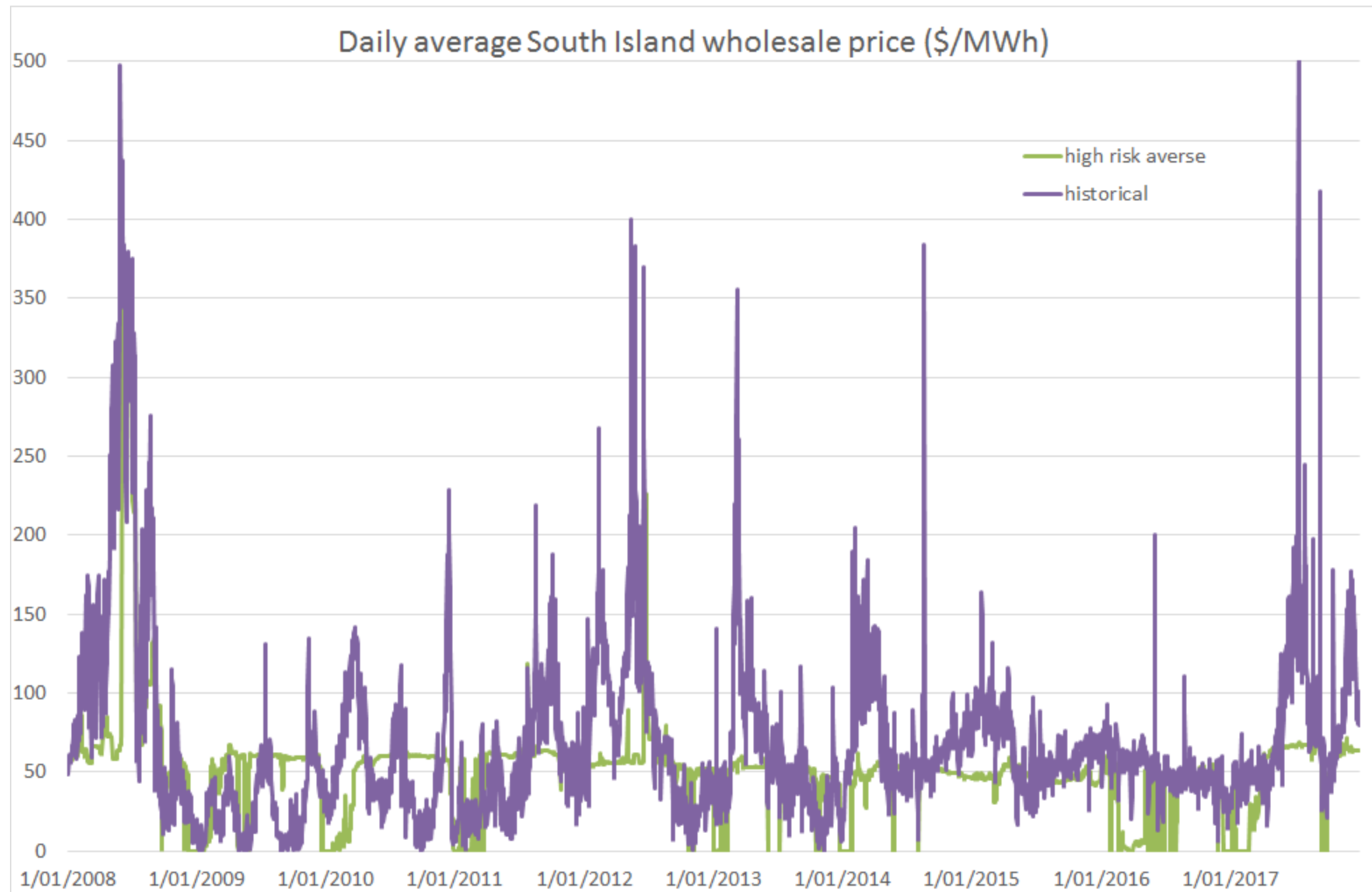
South Island Storage (MBIE fuel costs)



North Island Storage (MBIE fuel costs)



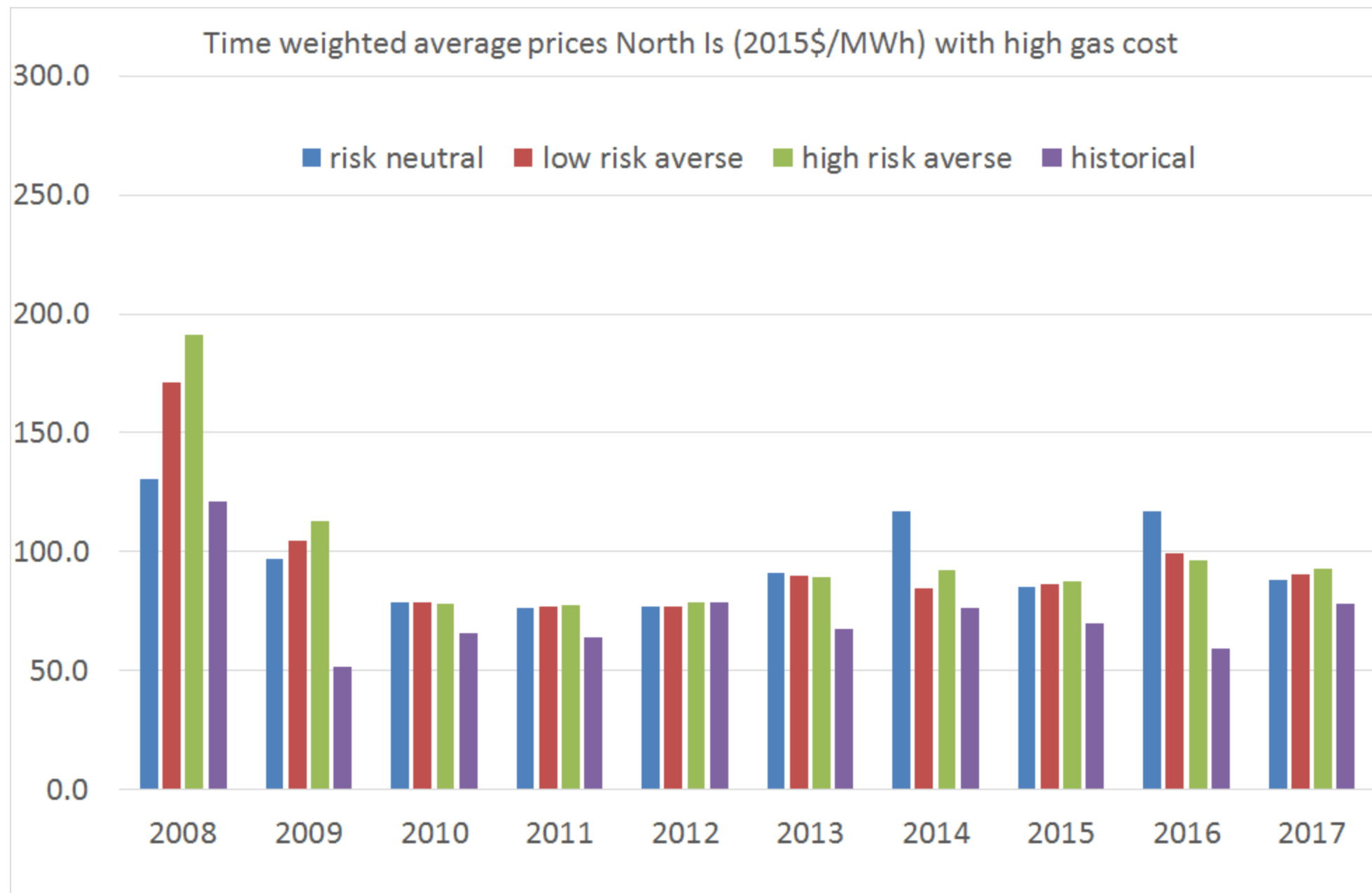


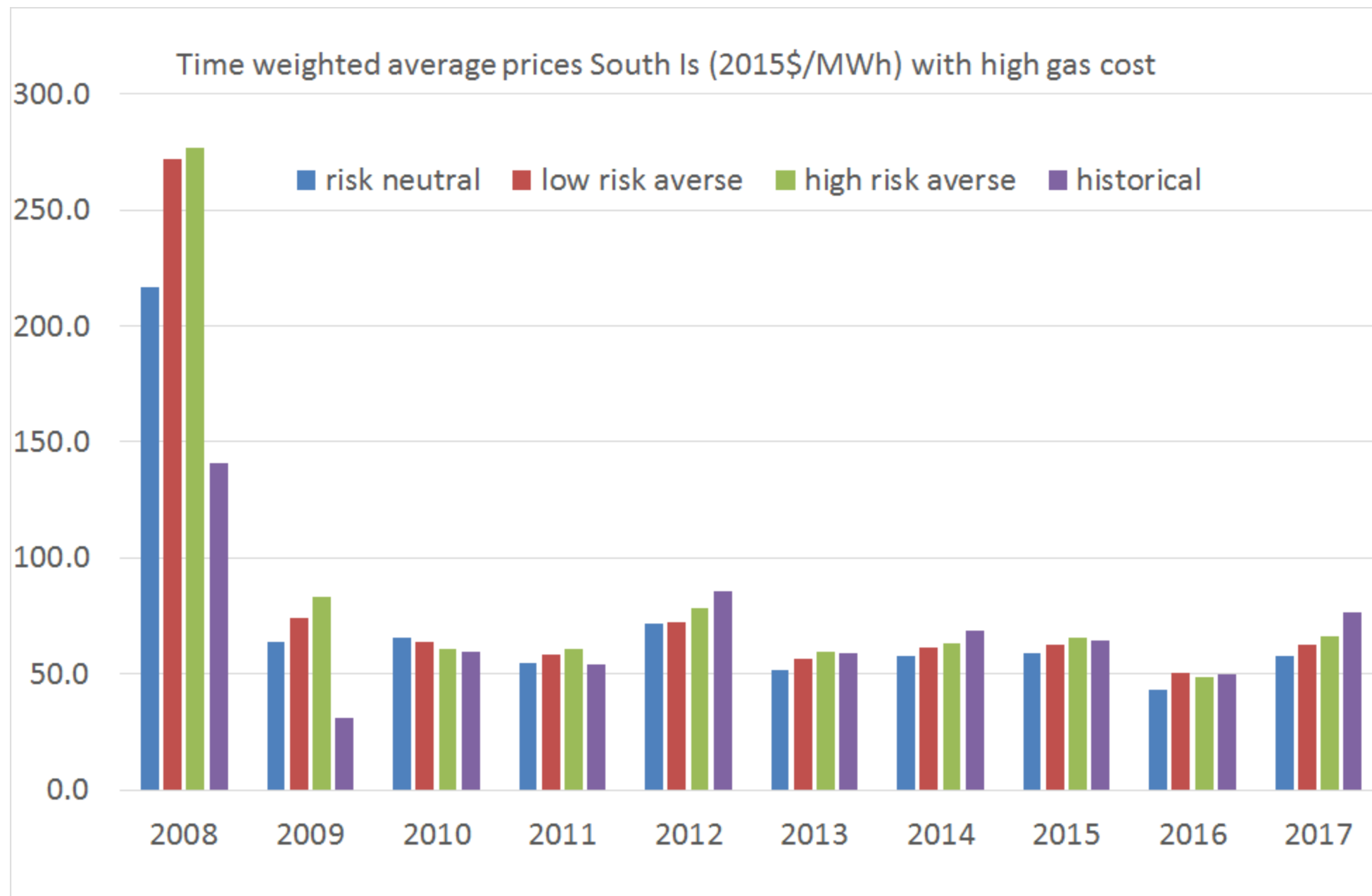


Results assuming FNZC gas costs

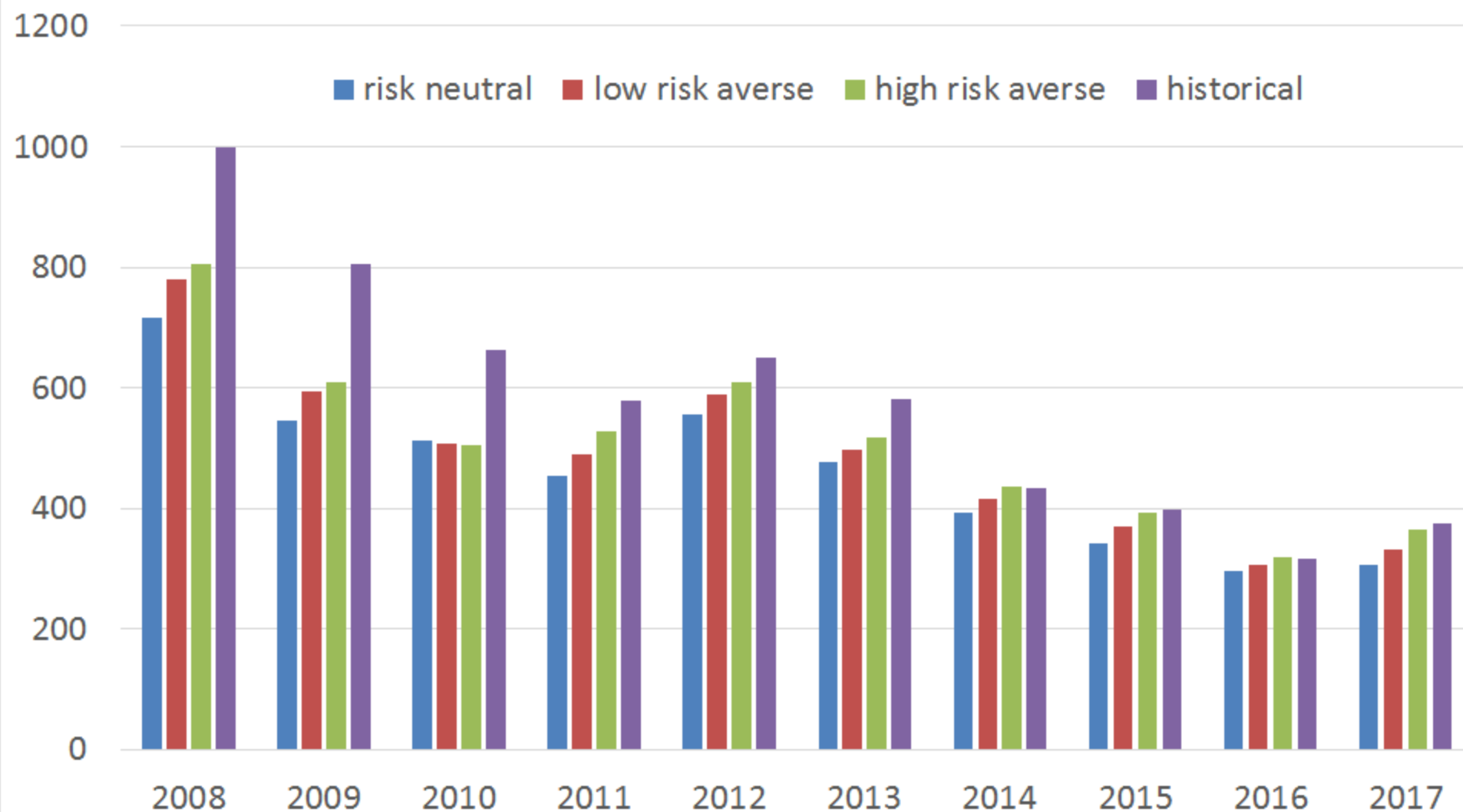
North Island and South Island storage in 2014



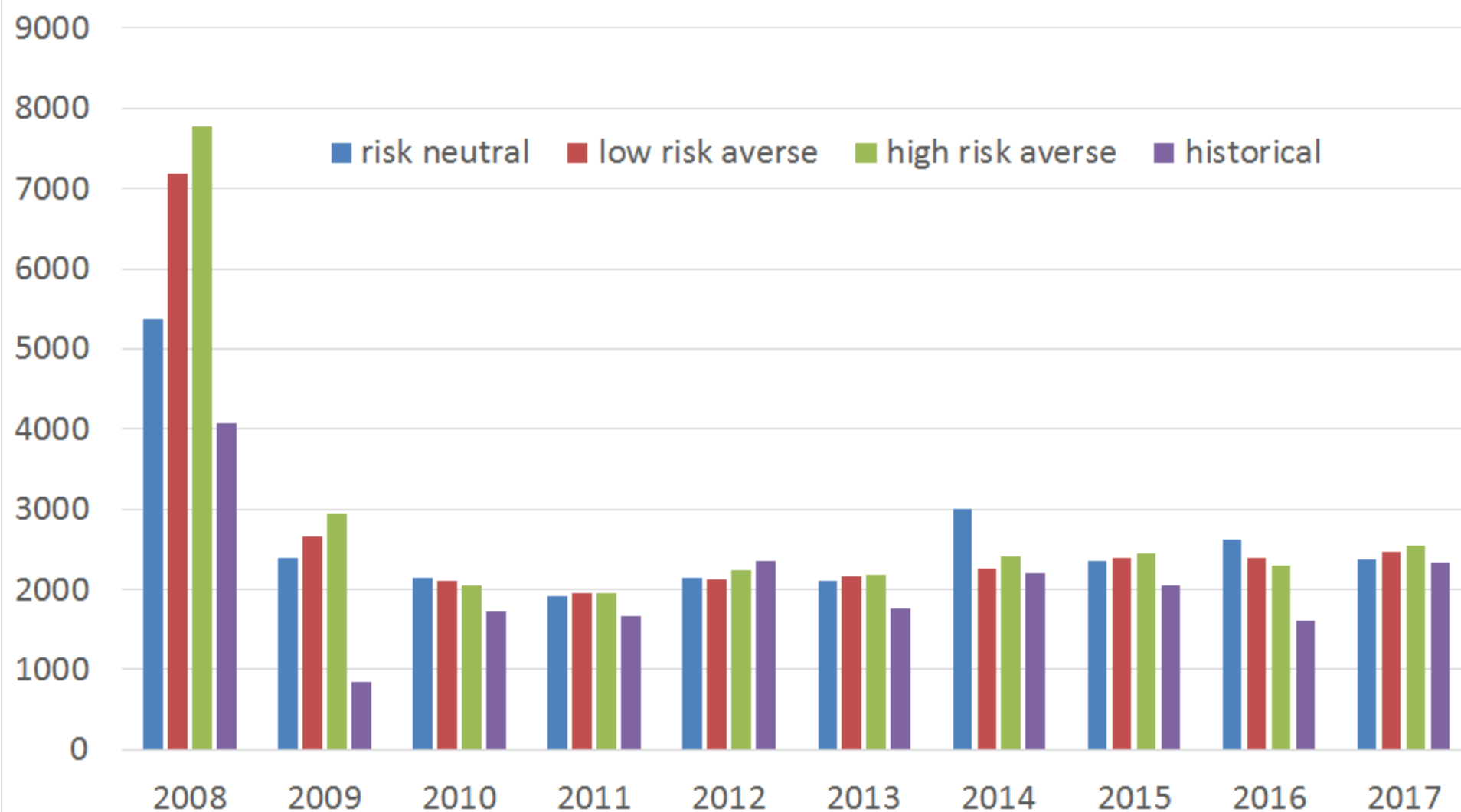




Simulated variable costs (2015\$M) assuming high gas cost

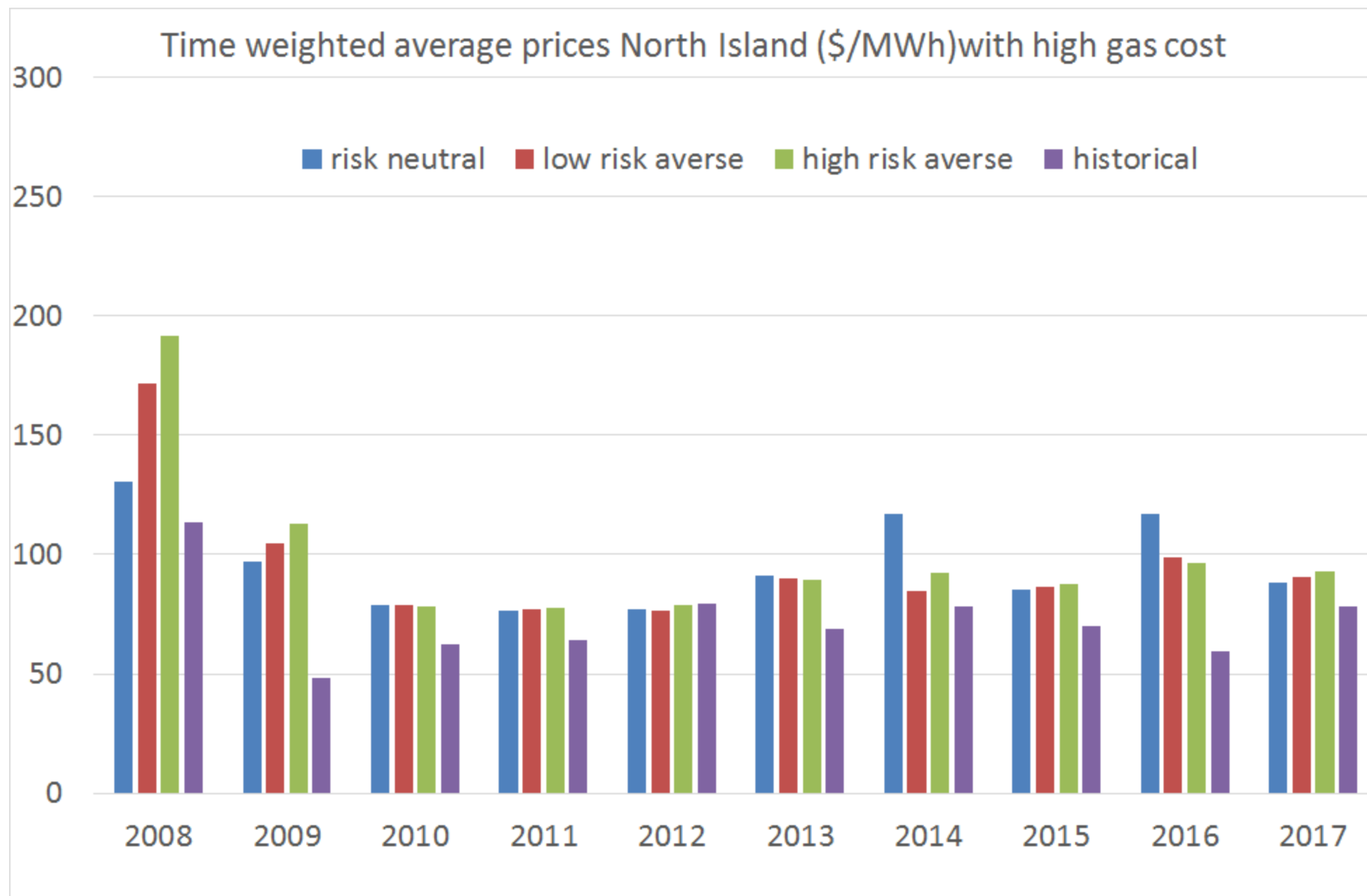


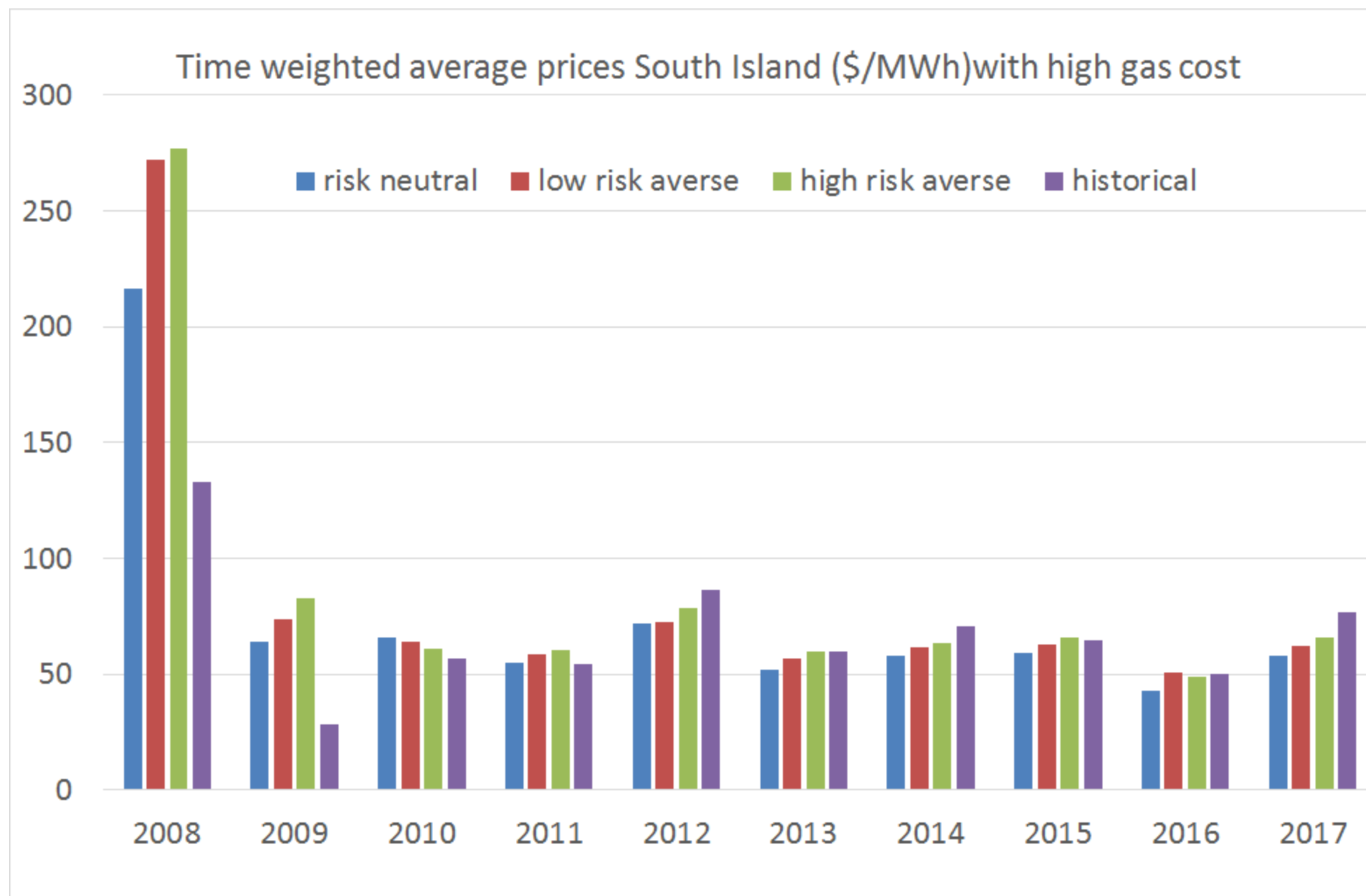
Simulated Ricardian rents (2015\$M) assuming high gas cost



(2015\$M)	risk neutral	low risk averse	high risk averse	historical
Savings	-5833	-7088	-8253	0

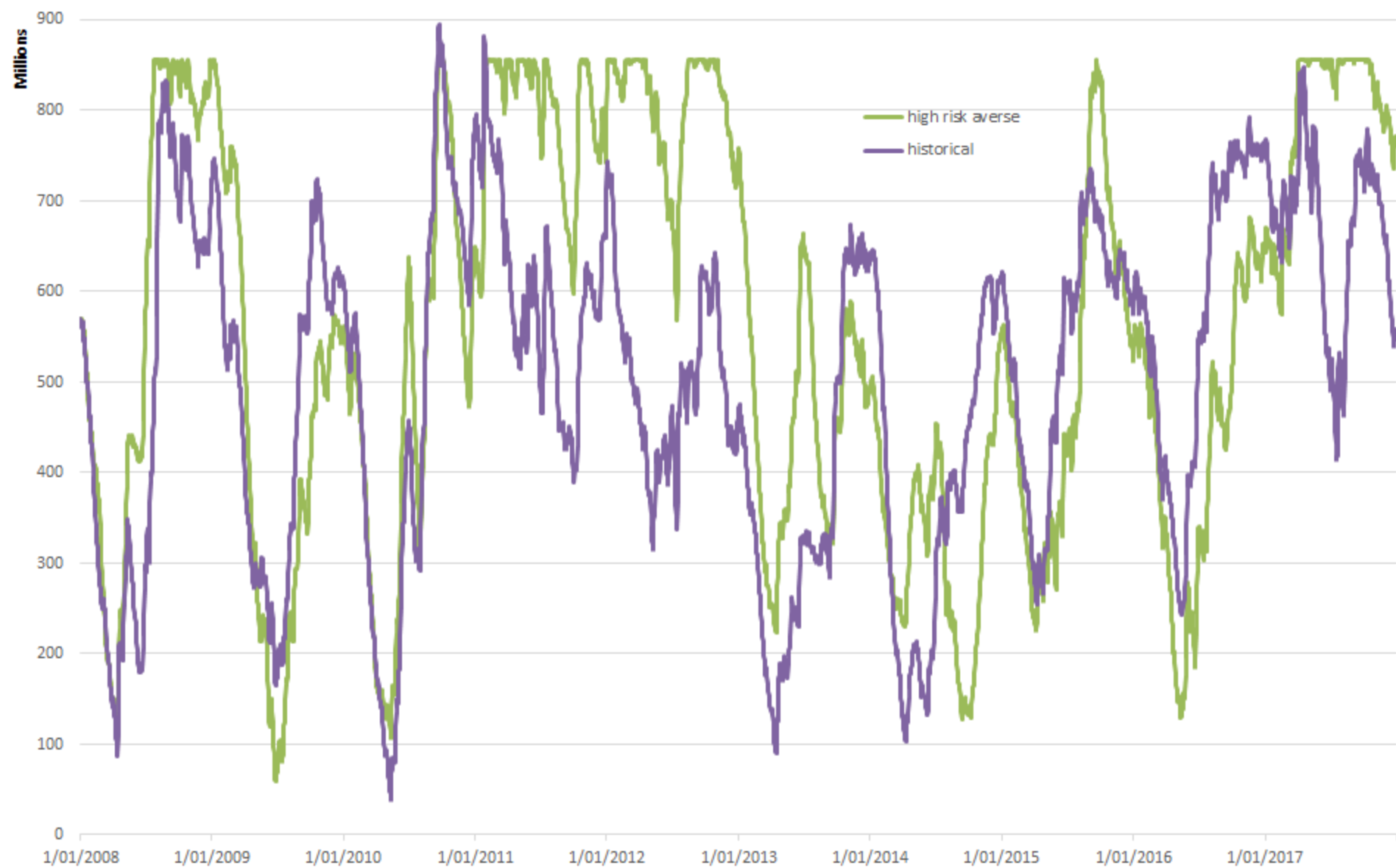
Old slides with prices (nominal)



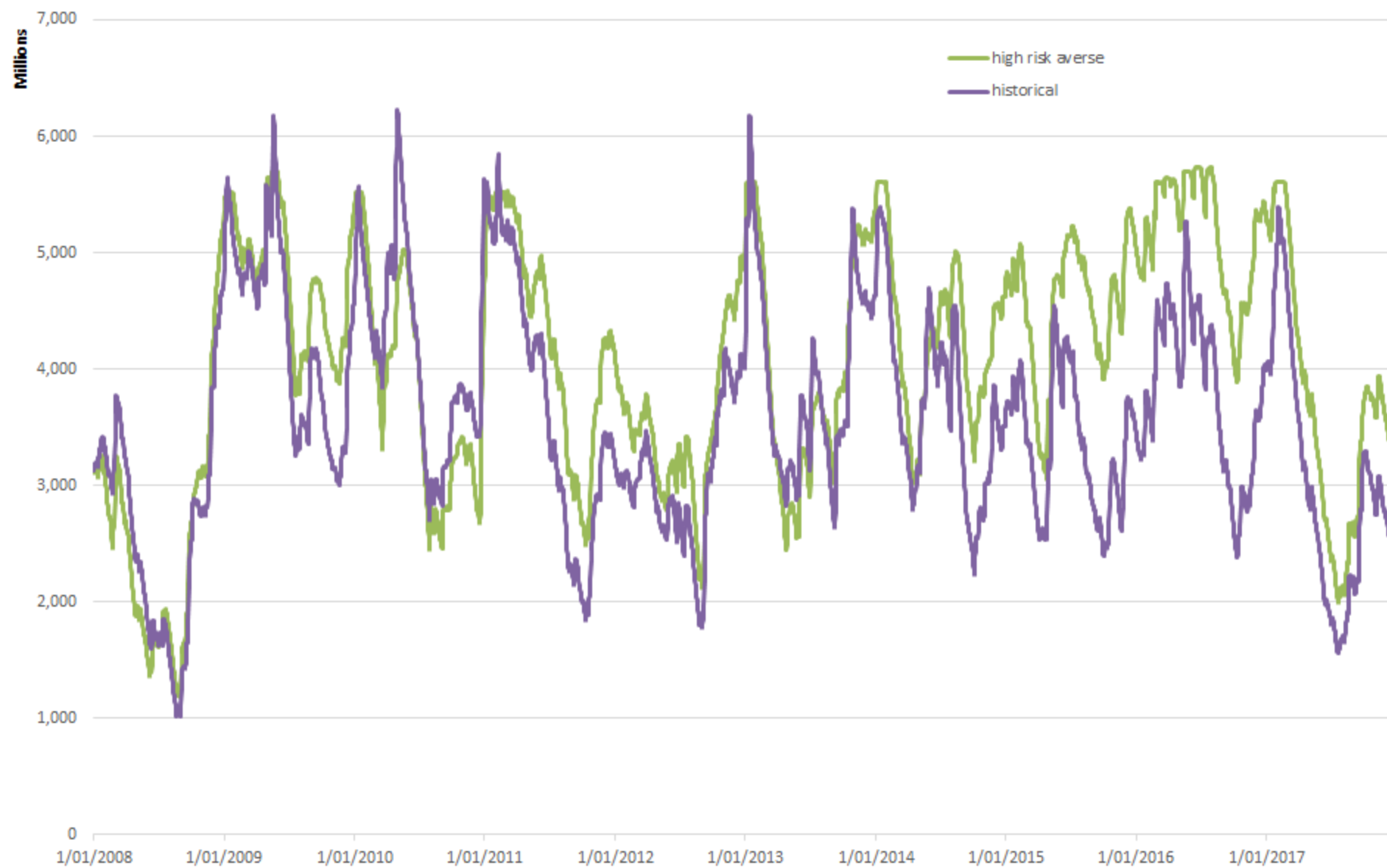


Big run using FNZC gas costs

North Island storage



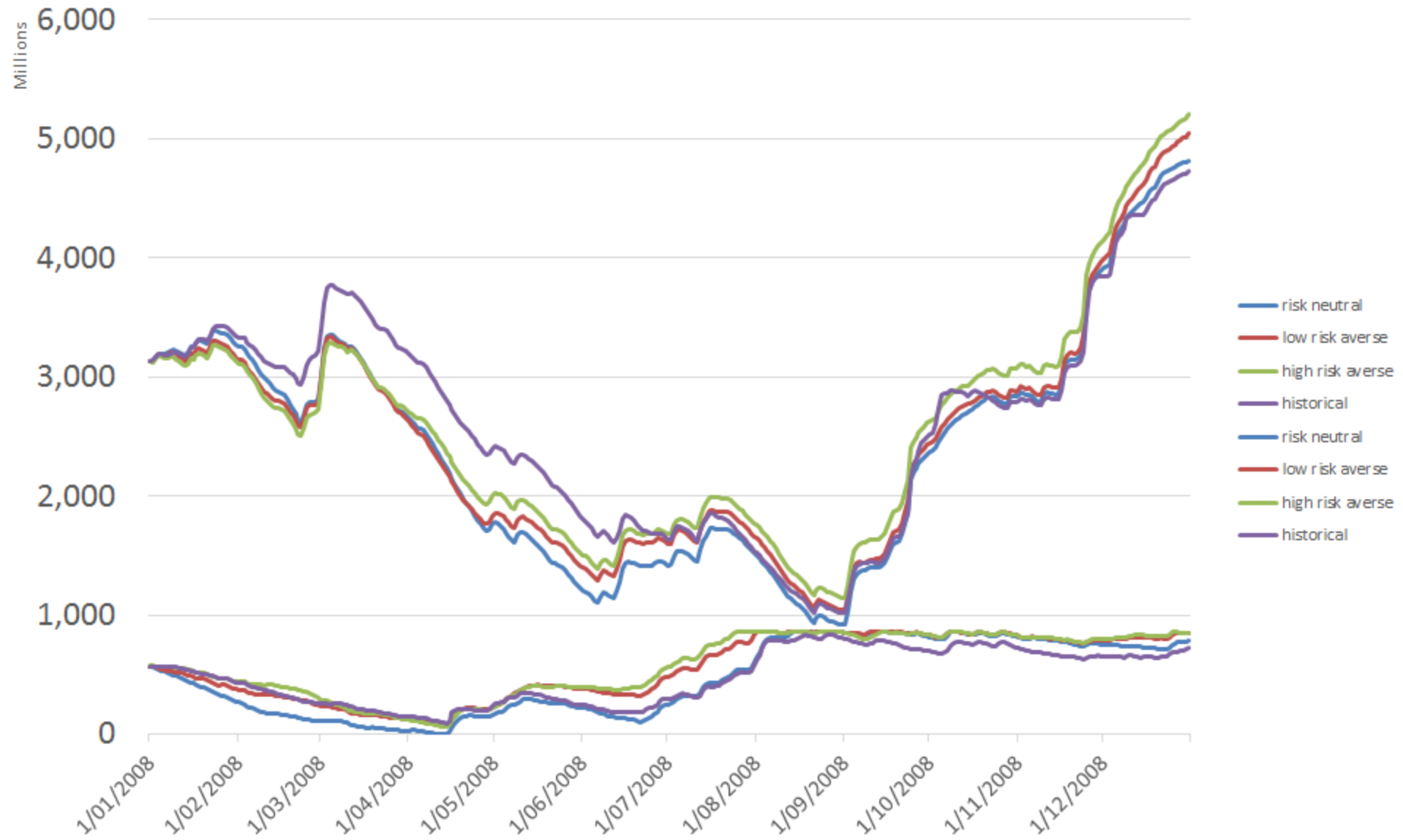
South Island storage



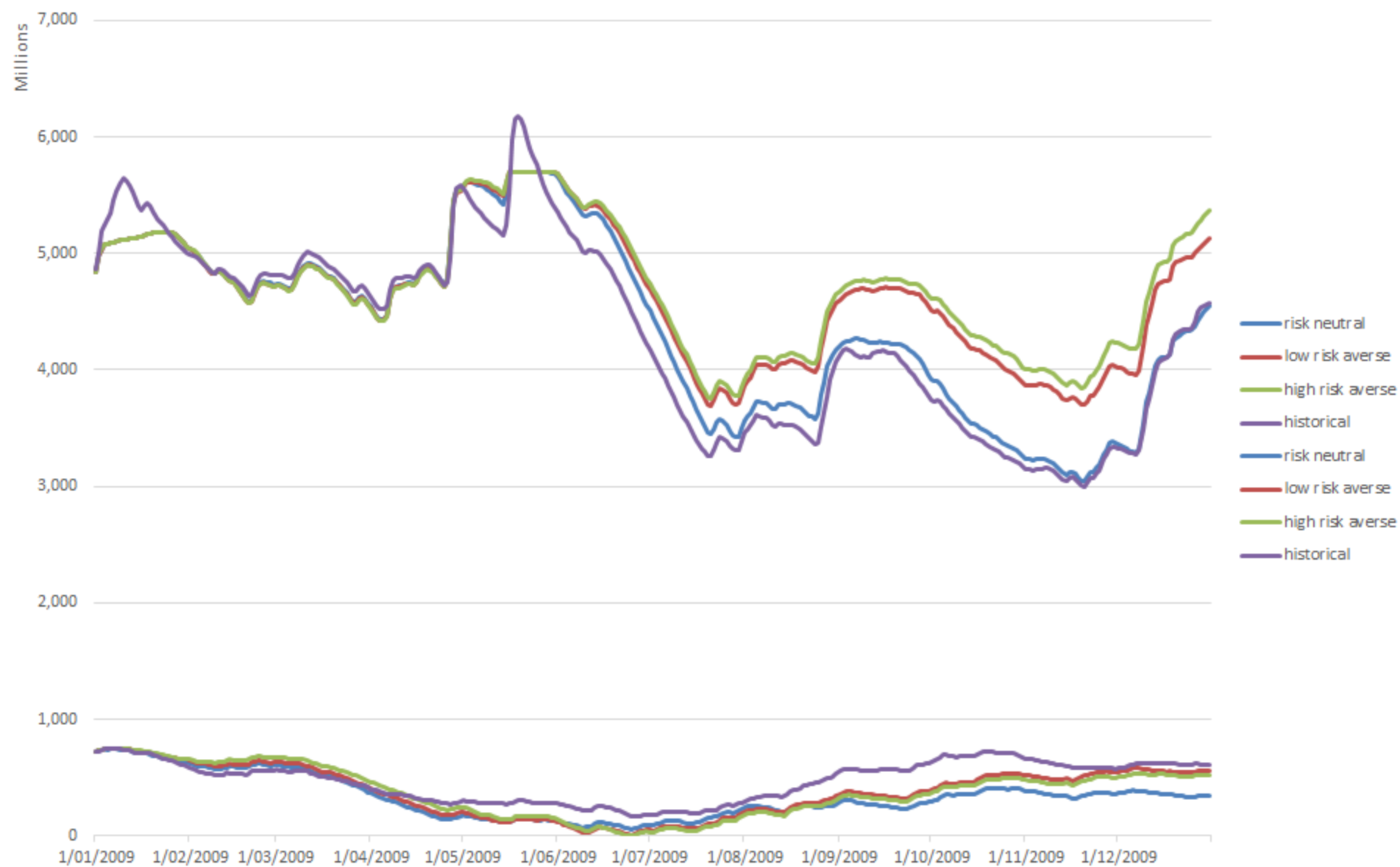
	Operating Costs (\$M)				Generation (GWh)		Average prices (\$/MWh)		
	Thermal cost	Future cost	Lost load (MWh)	Hydro	Thermal	Total	NI	HAY	SI
counterfactual	5,046	-503	208	207,257	73,689	280,946	100.3	101.2	84.6
historical	5,800	-531	119	207,951	78,488	286,439	72.8	72.1	68.6
difference	-754	28	90	-694	-4,799	-5,494	27.5	29.1	16.0

Storage

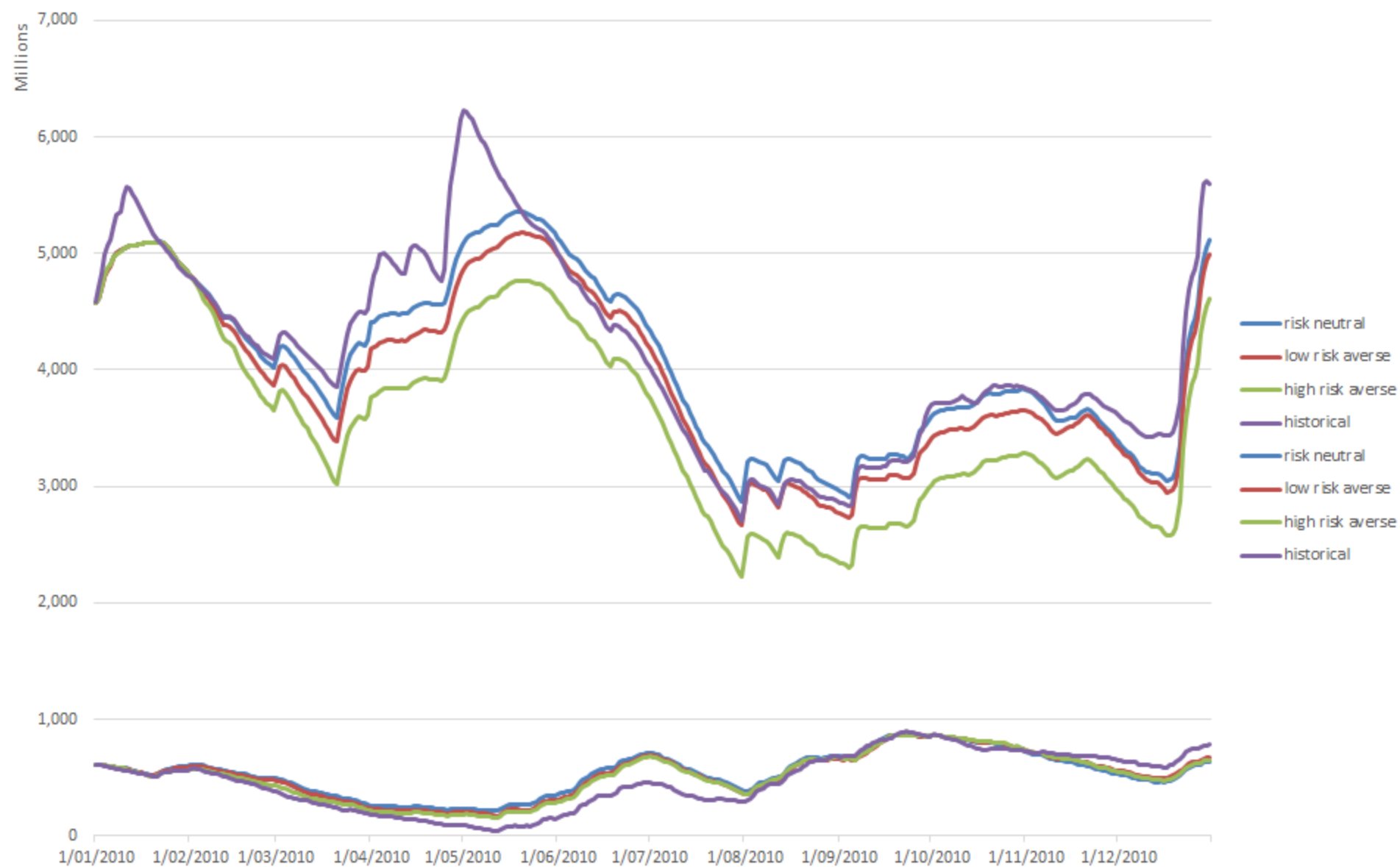
North Island and South Island storage in 2008



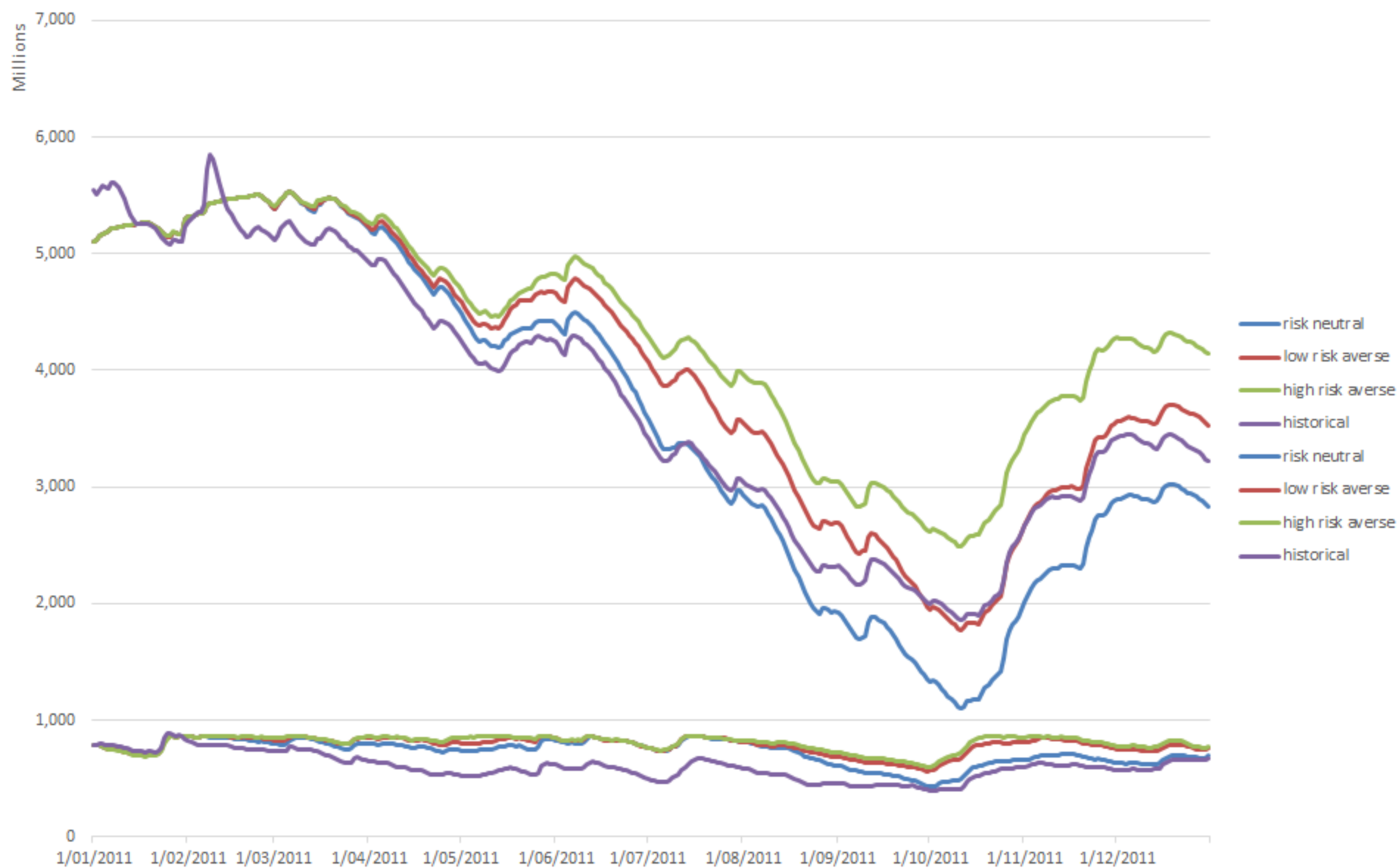
North Island and South Island storage in 2009



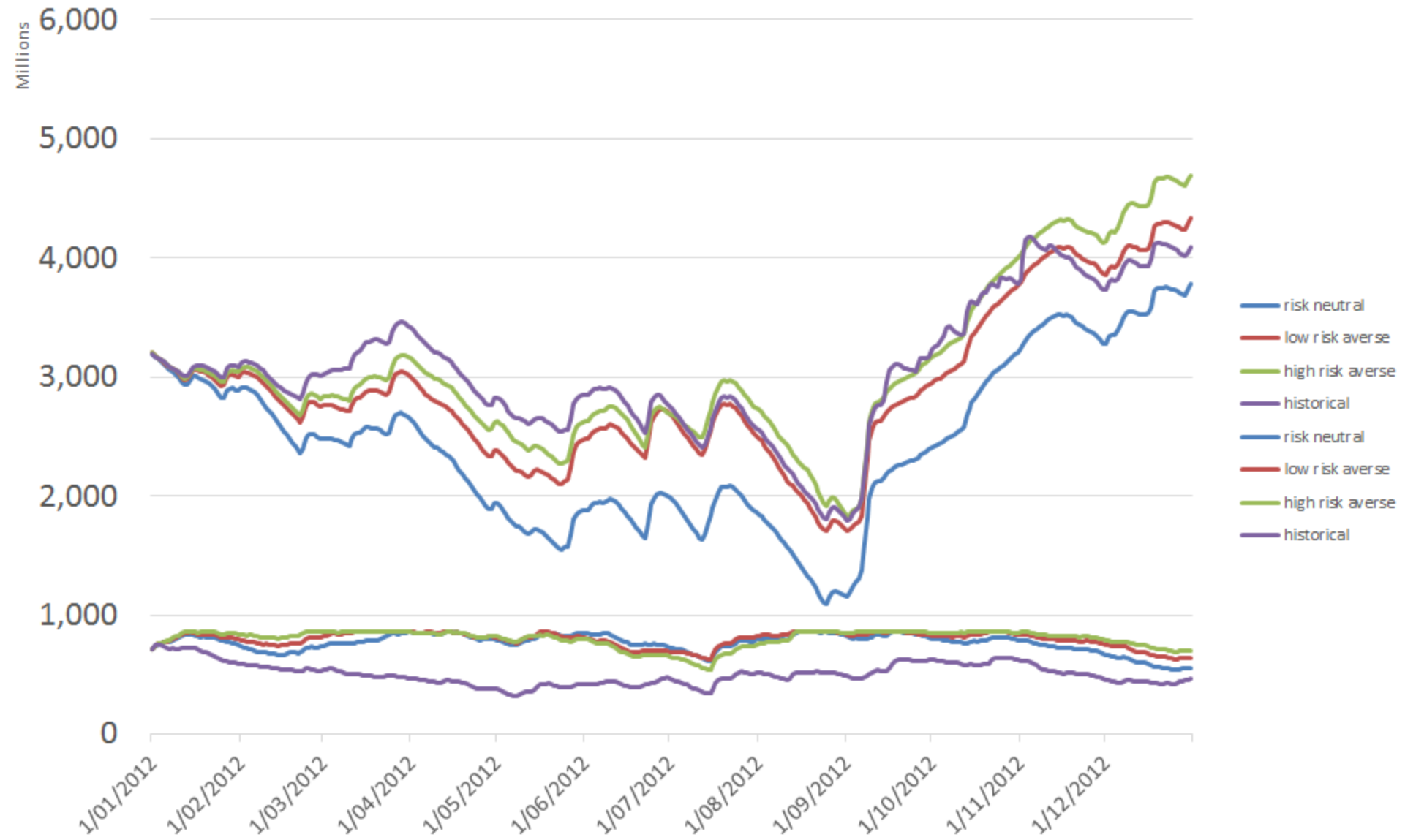
North Island and South Island storage in 2010



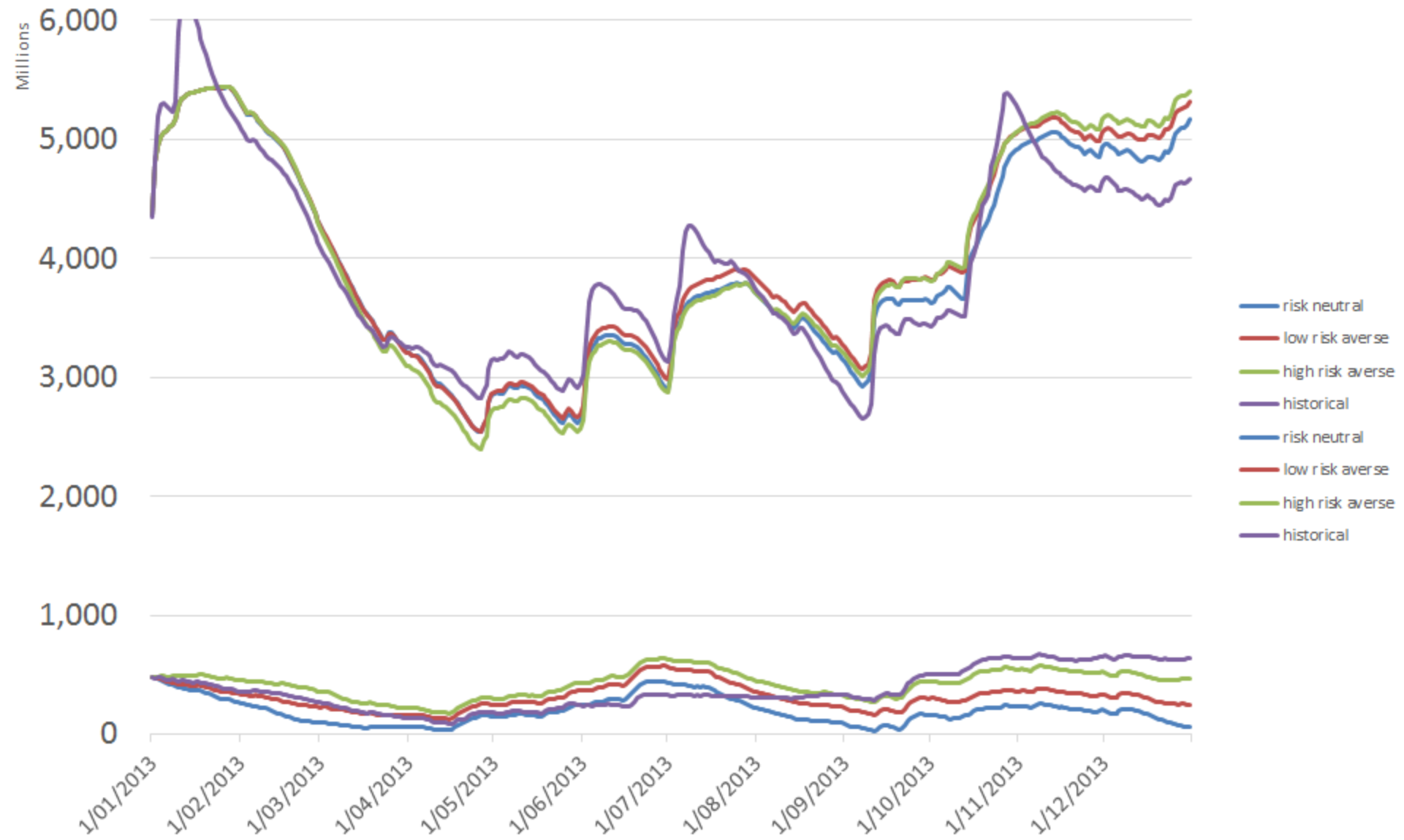
North Island and South Island storage in 2011



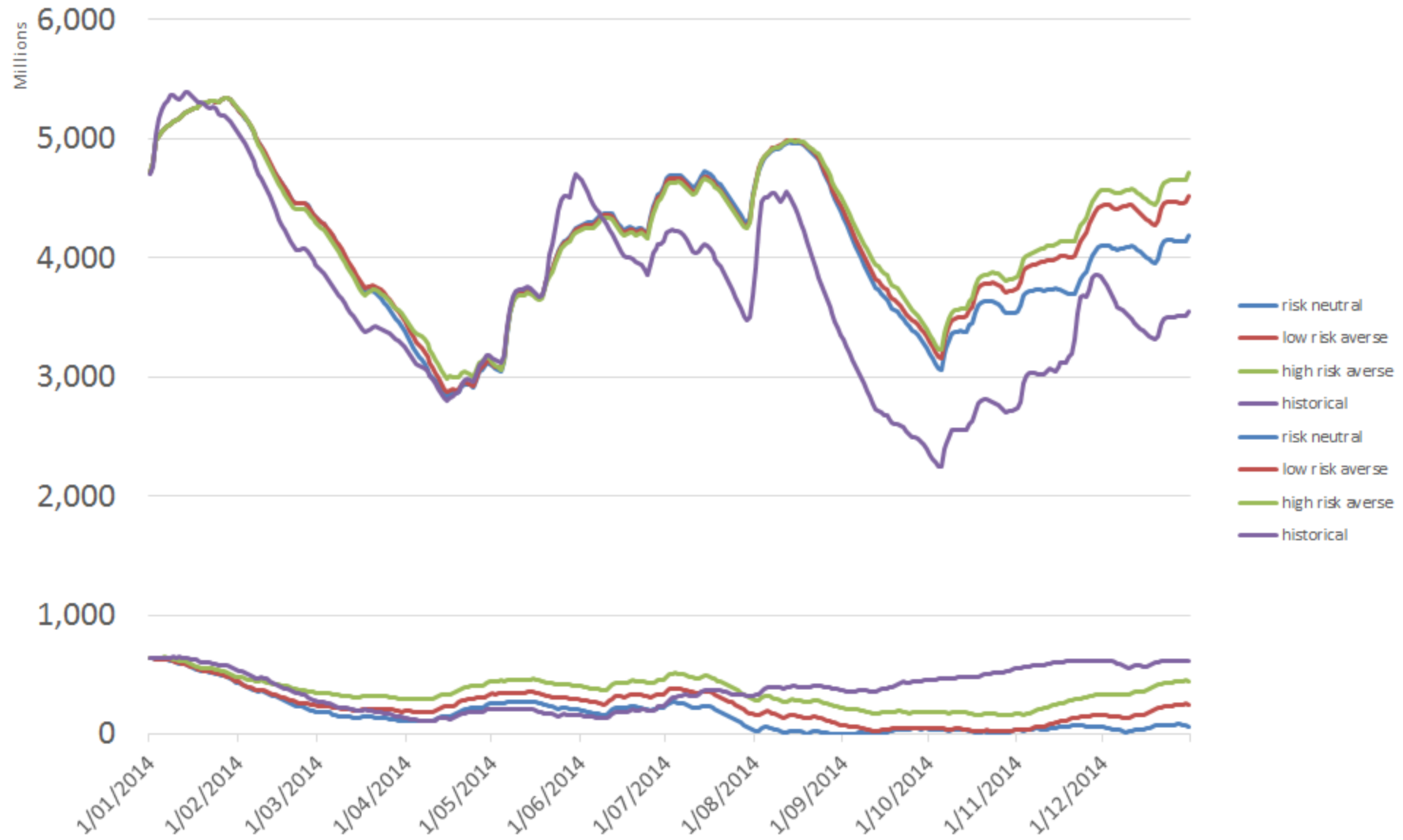
North Island and South Island storage in 2012



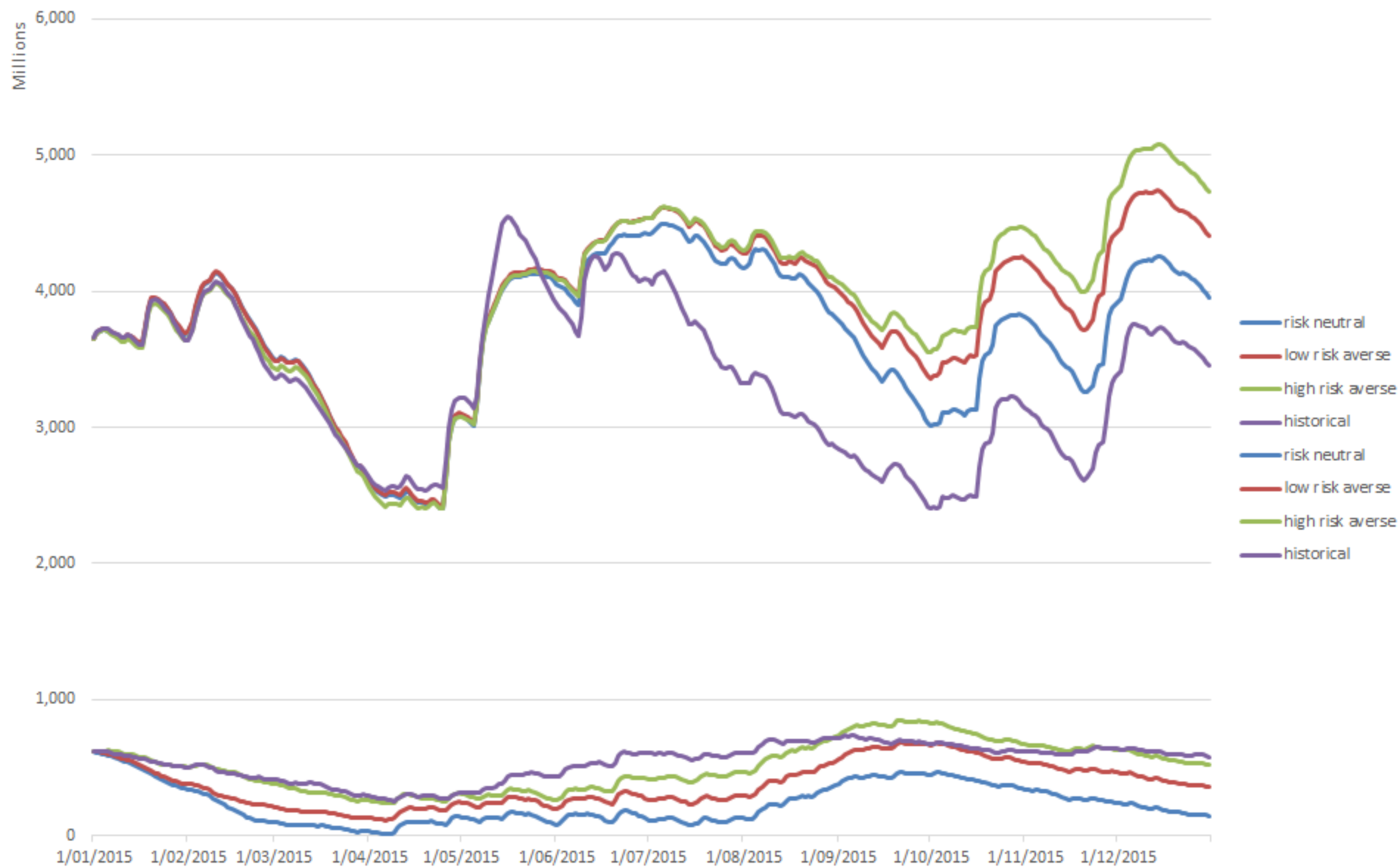
North Island and South Island storage in 2013



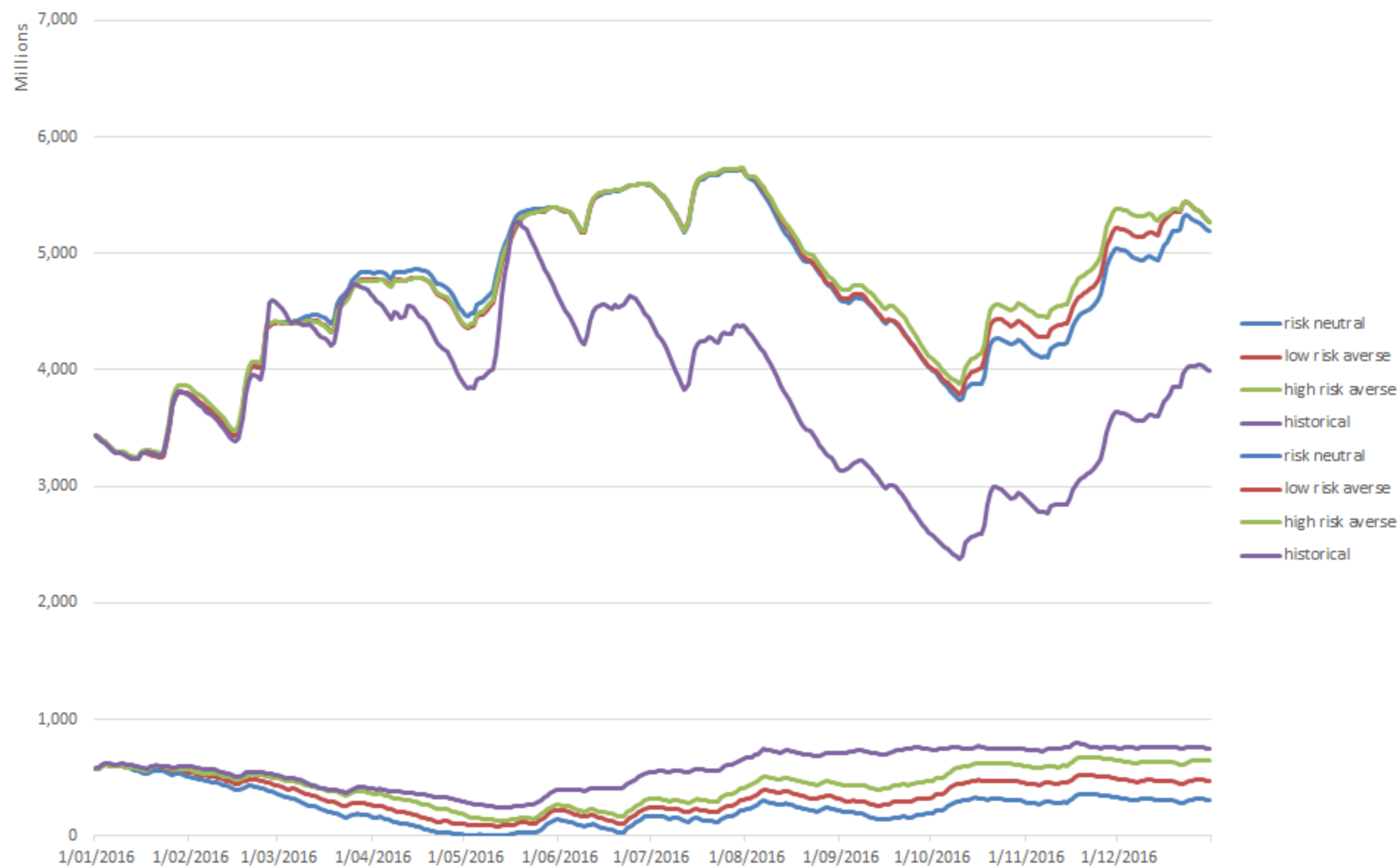
North Island and South Island storage in 2014



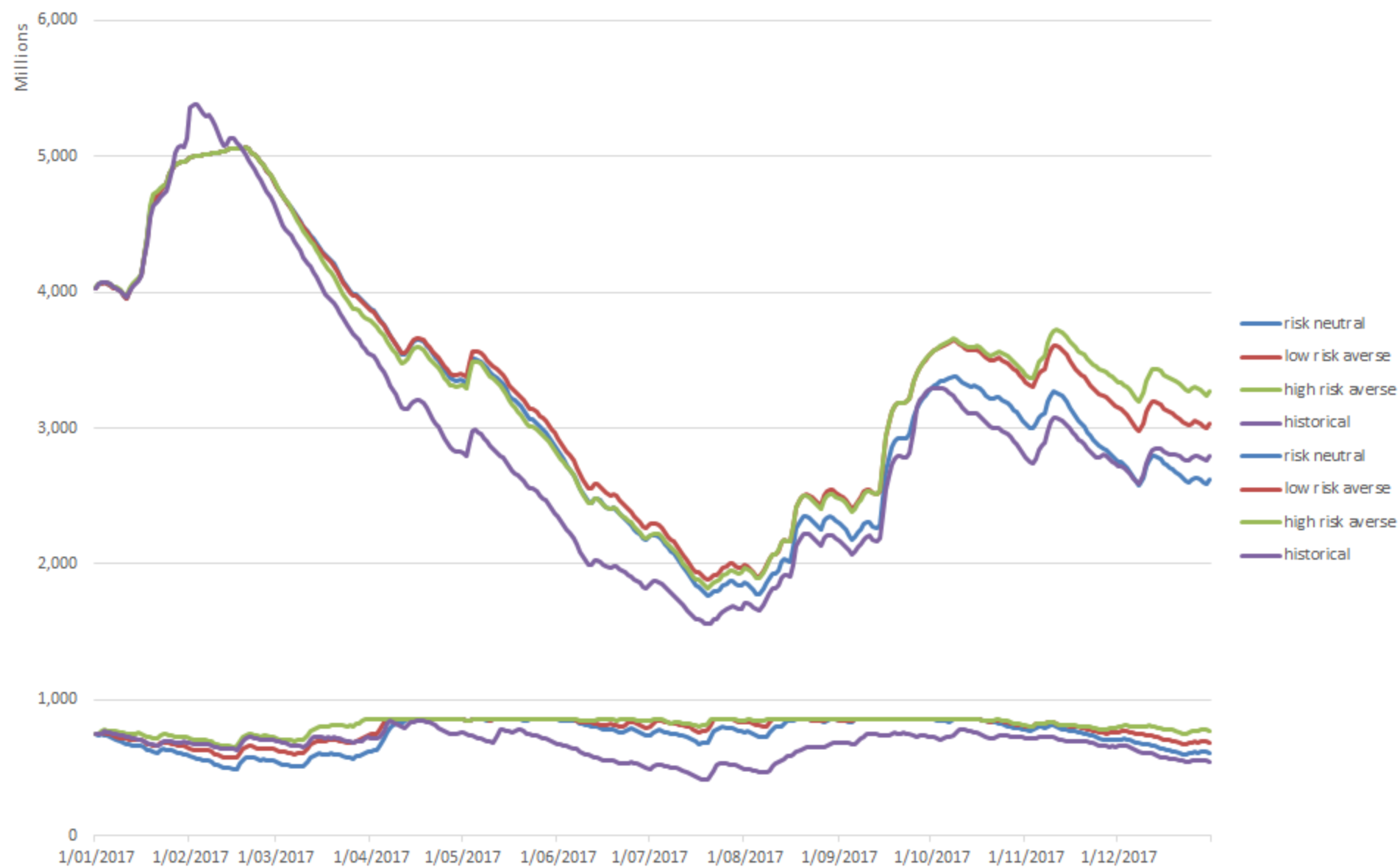
North Island and South Island storage in 2015



North Island and South Island storage in 2016

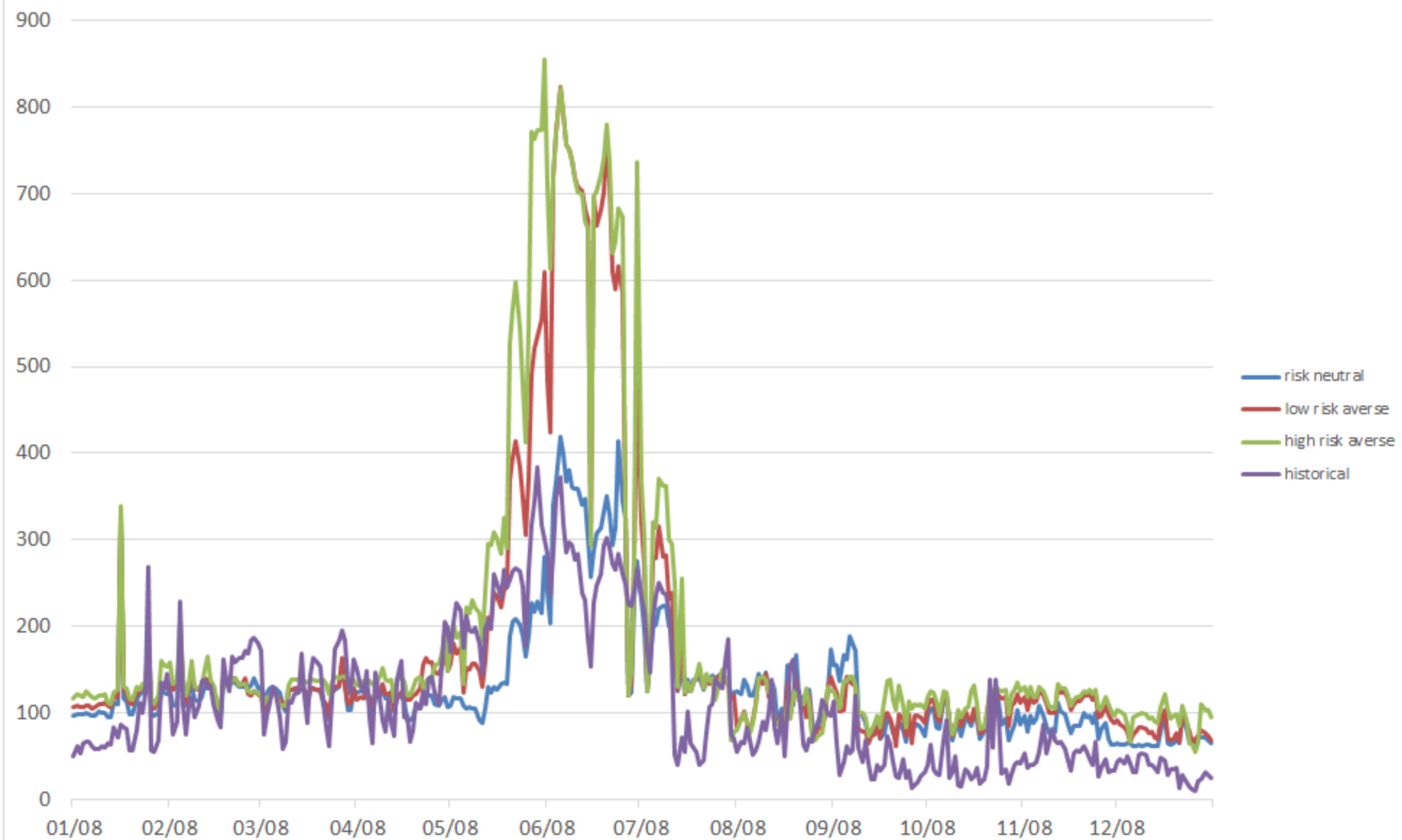


North Island and South Island storage in 2017

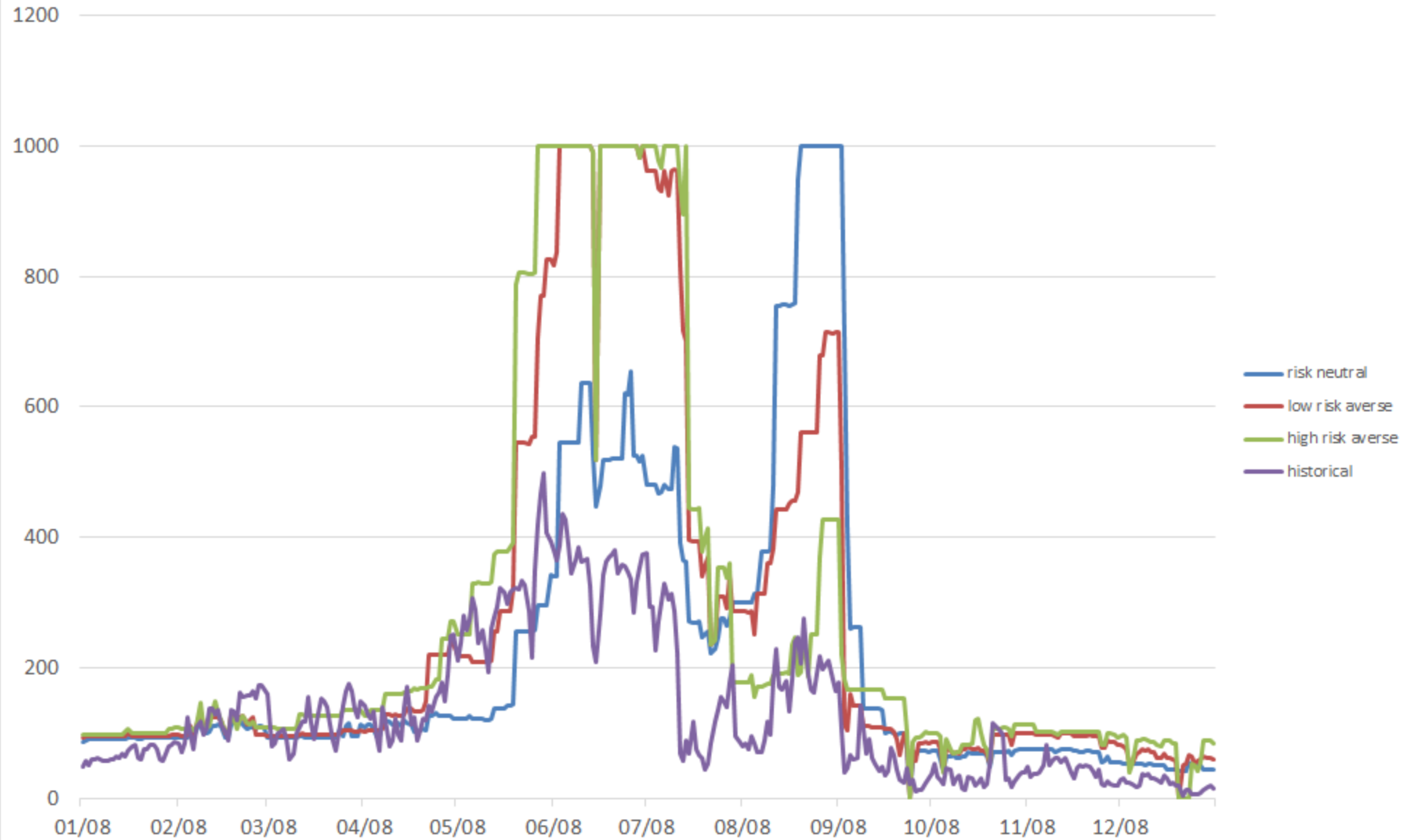


Old slides with prices (nominal)

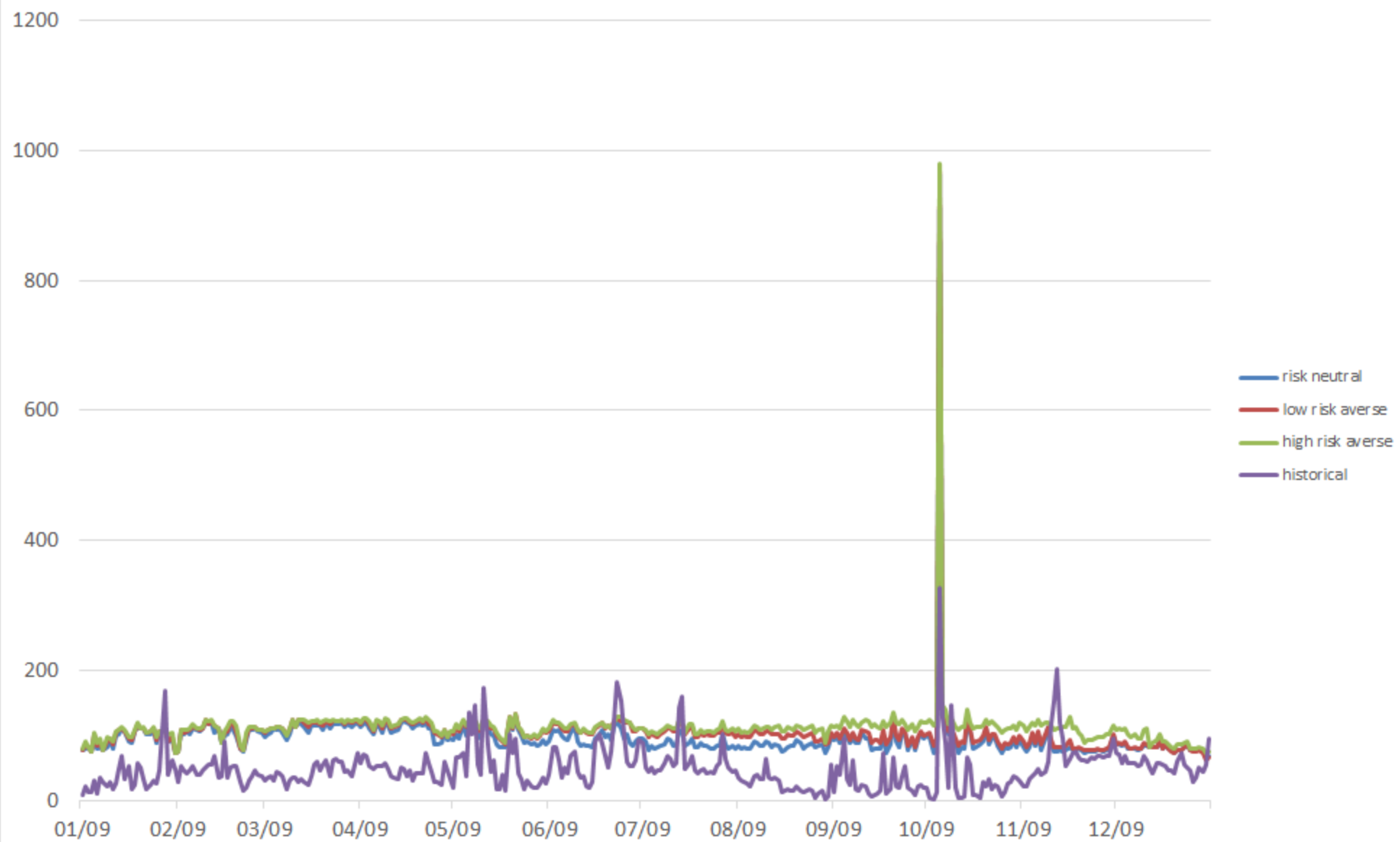
Time weighted average price of NI in 2008



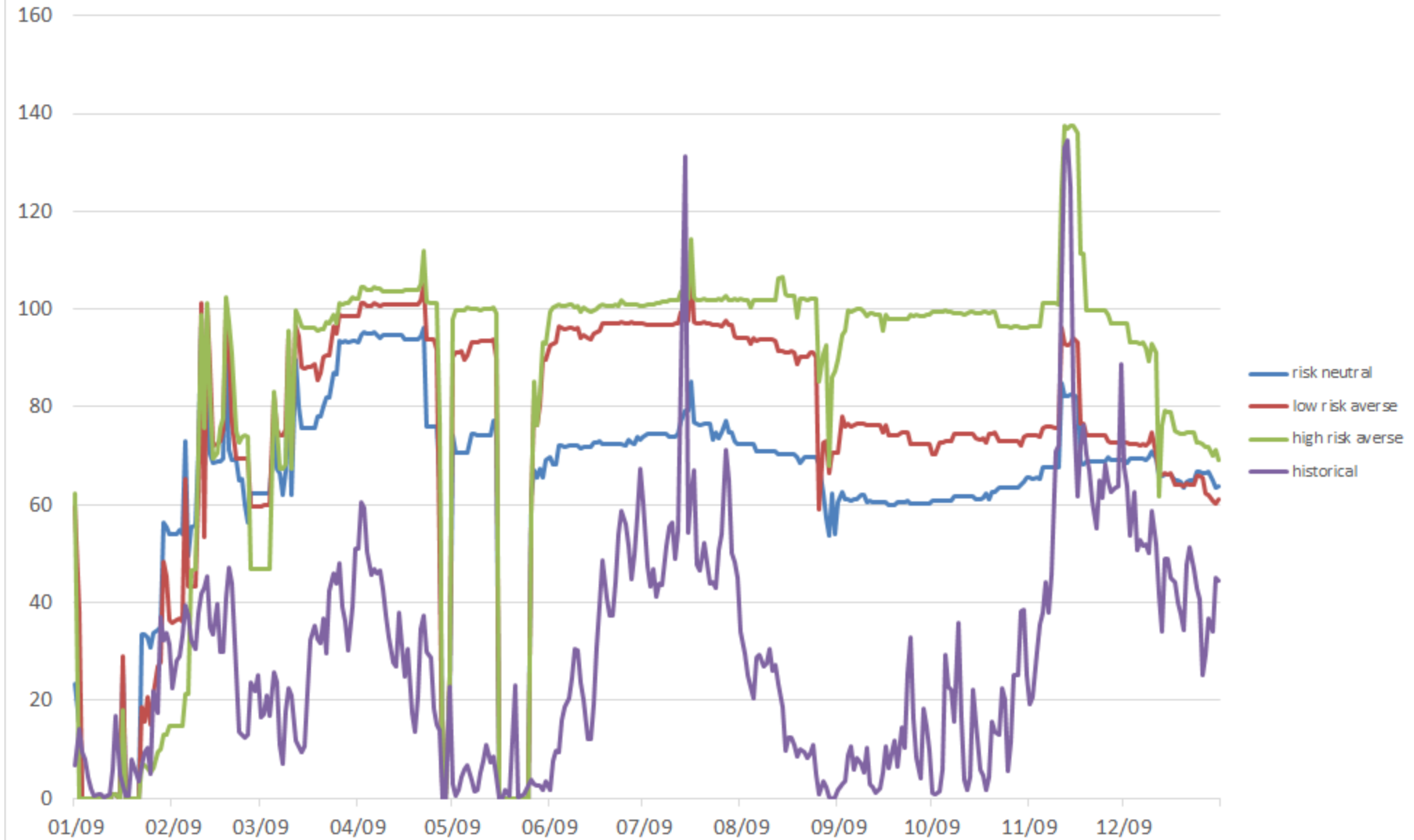
Time weighted average price of SI in 2008



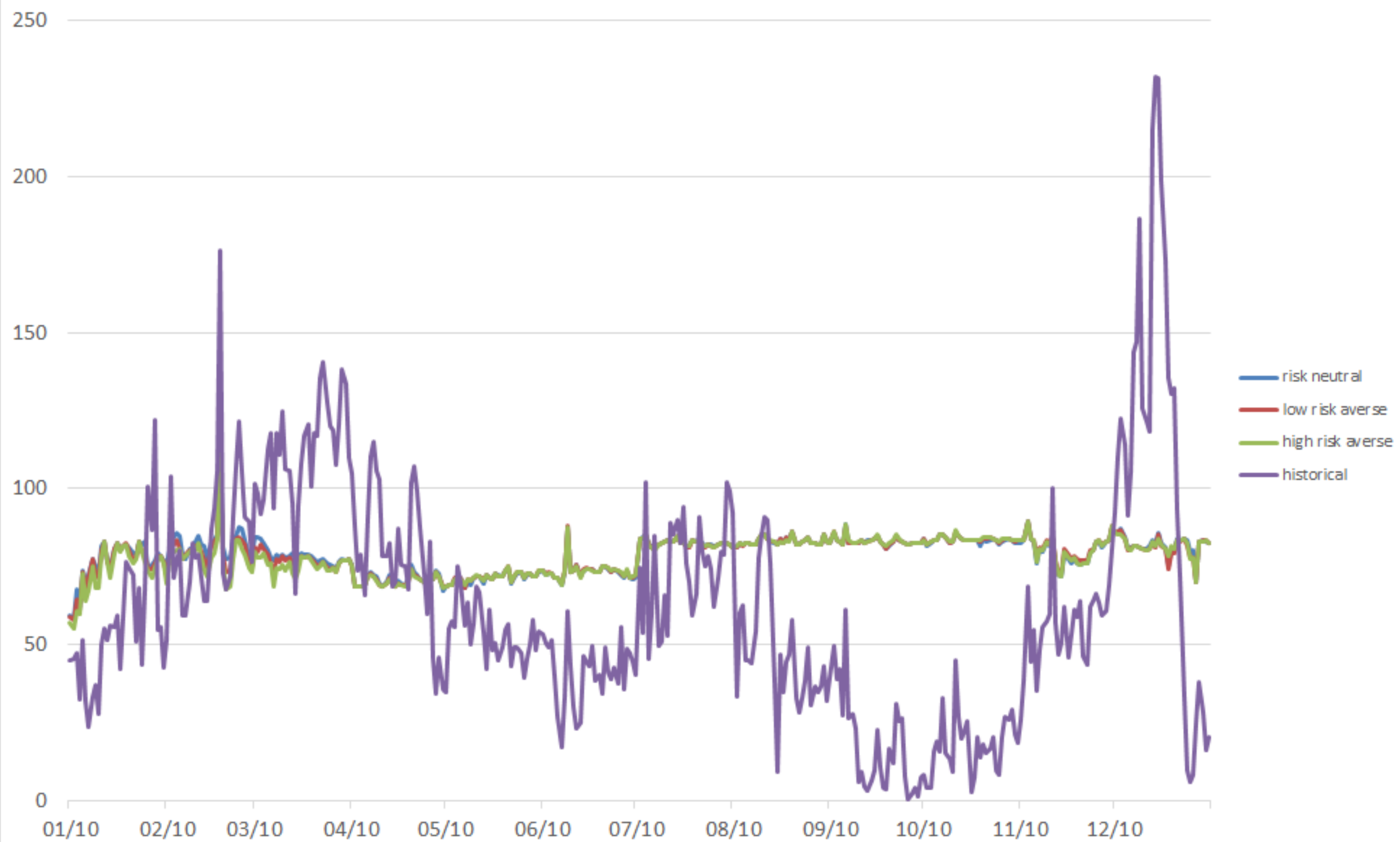
Time weighted average price of NI in 2009



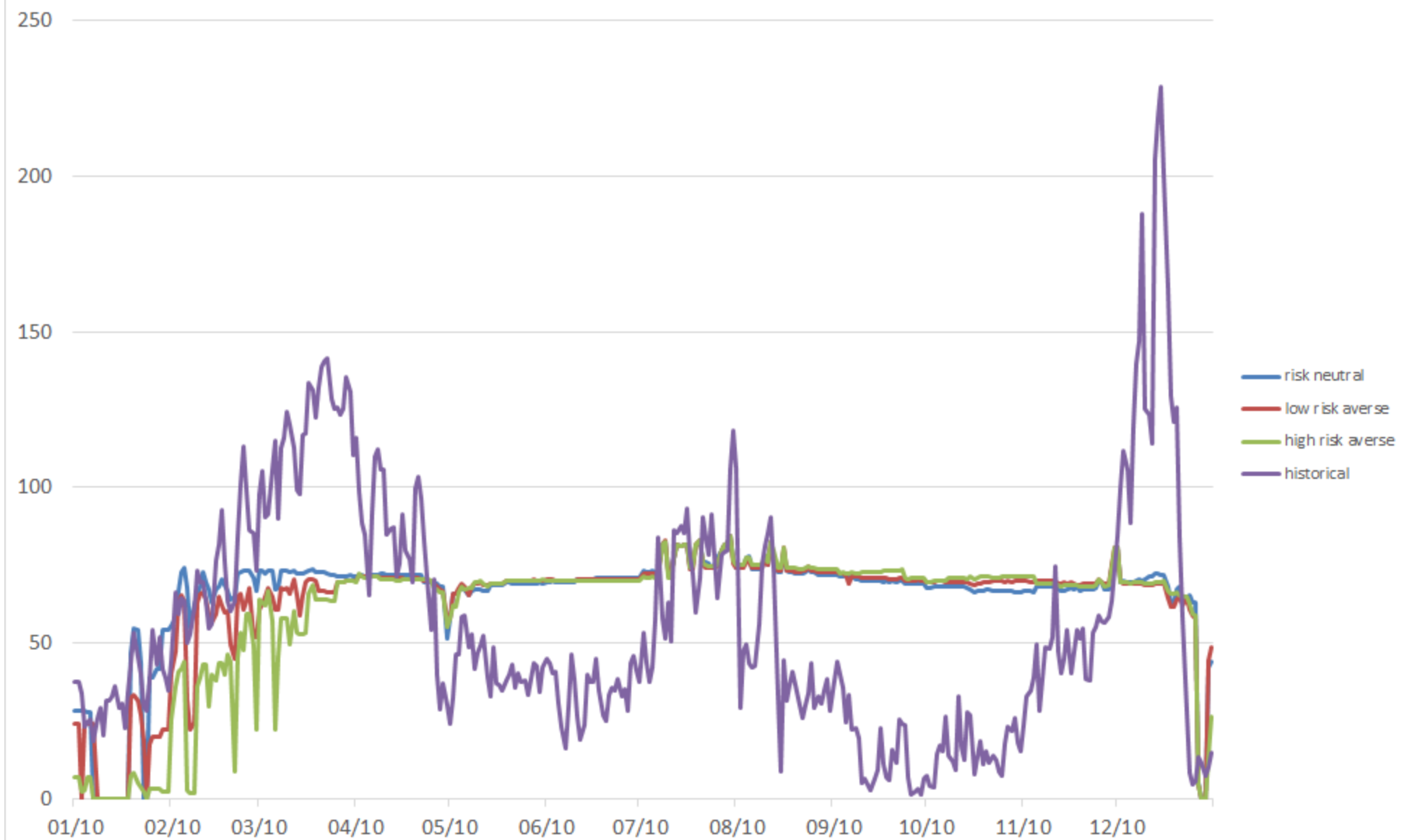
Time weighted average price of SI in 2009



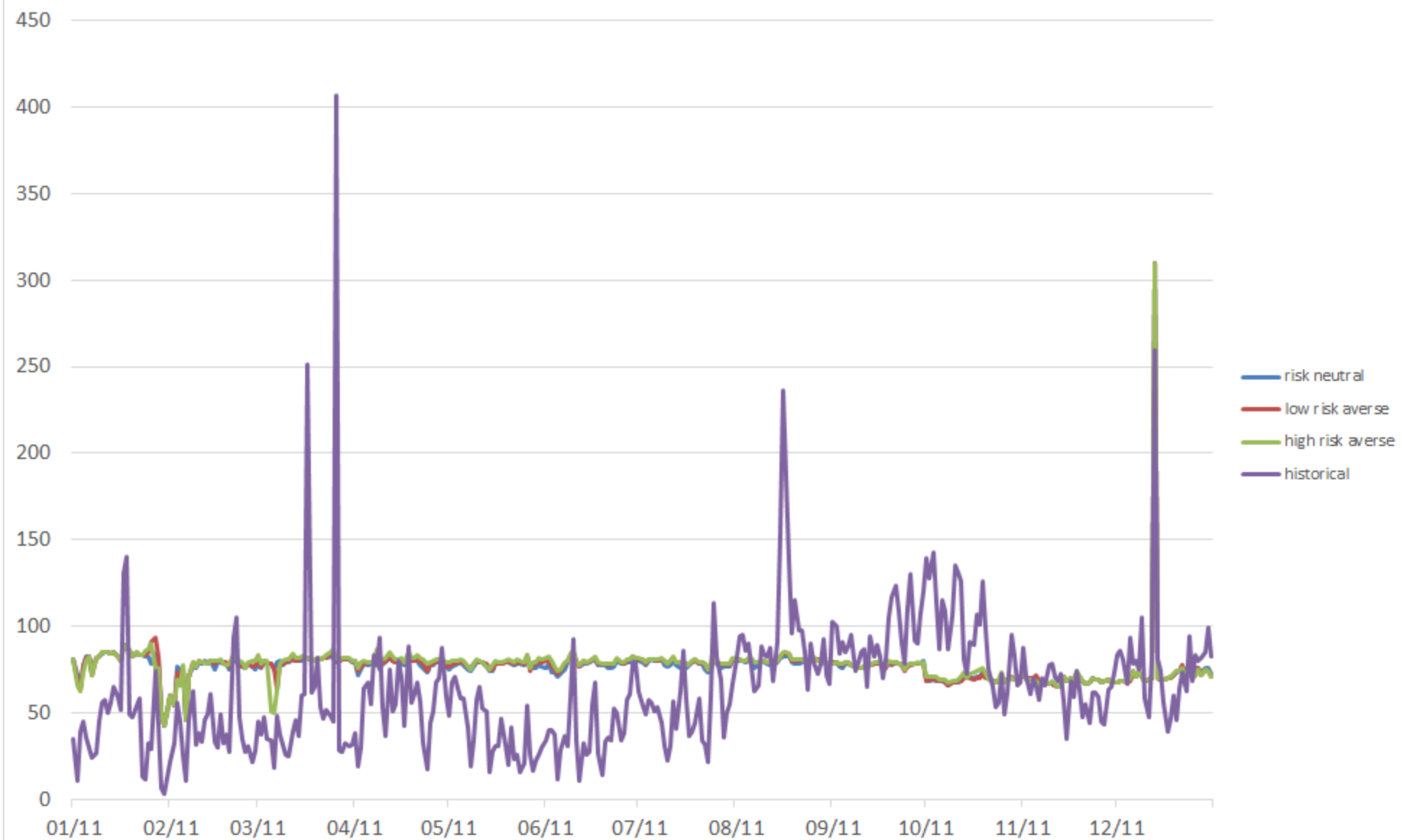
Time weighted average price of NI in 2010



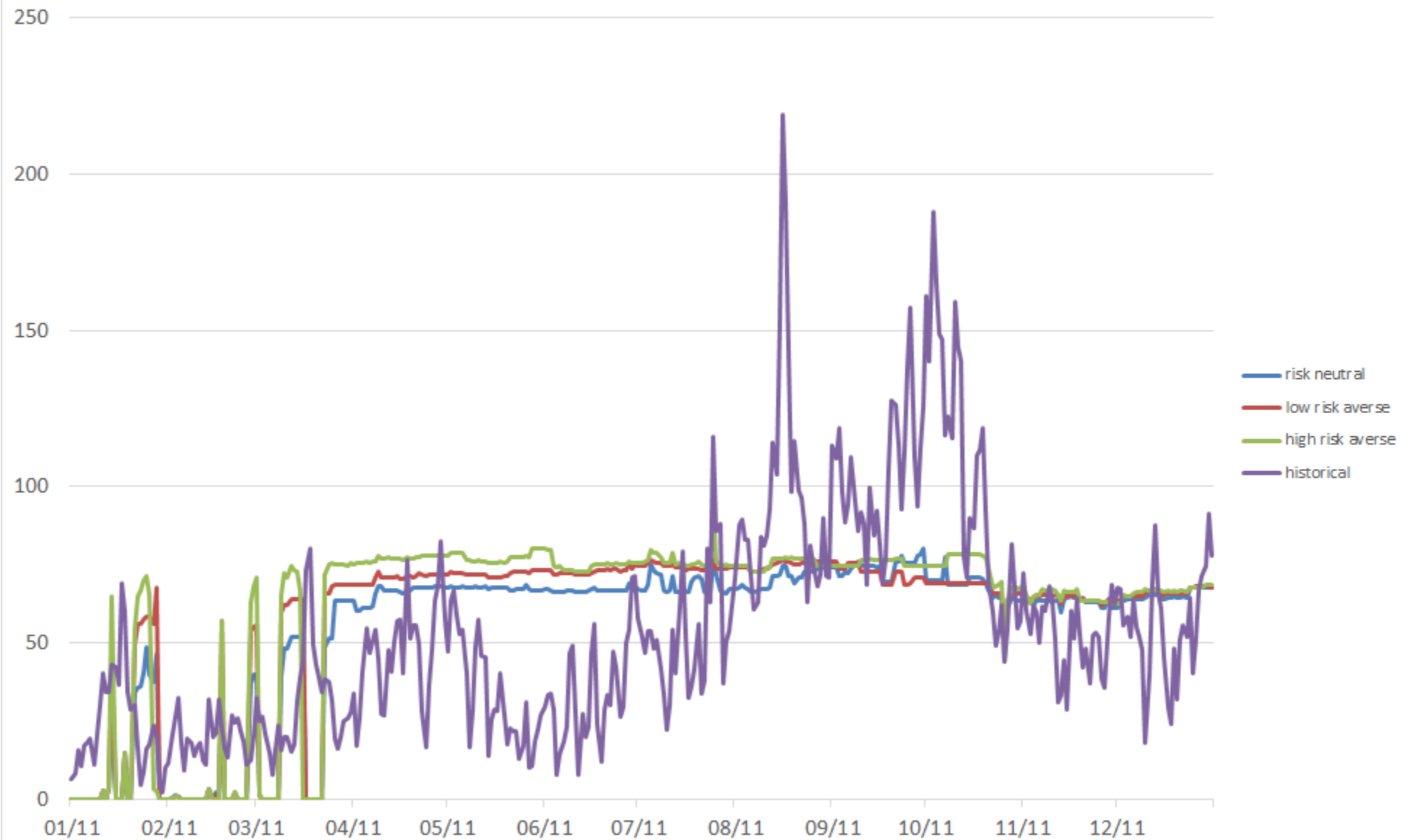
Time weighted average price of SI in 2010

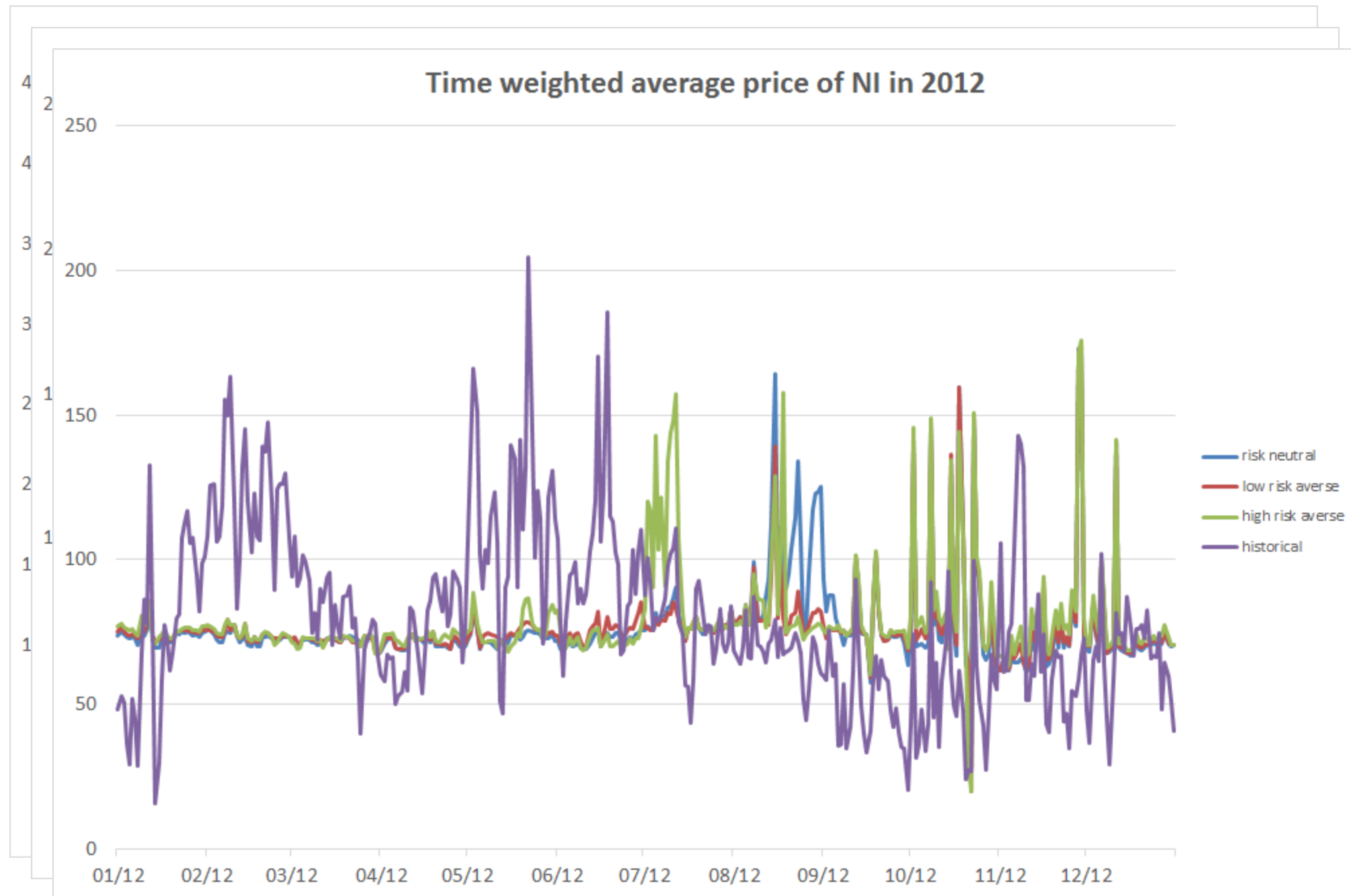


Time weighted average price of NI in 2011

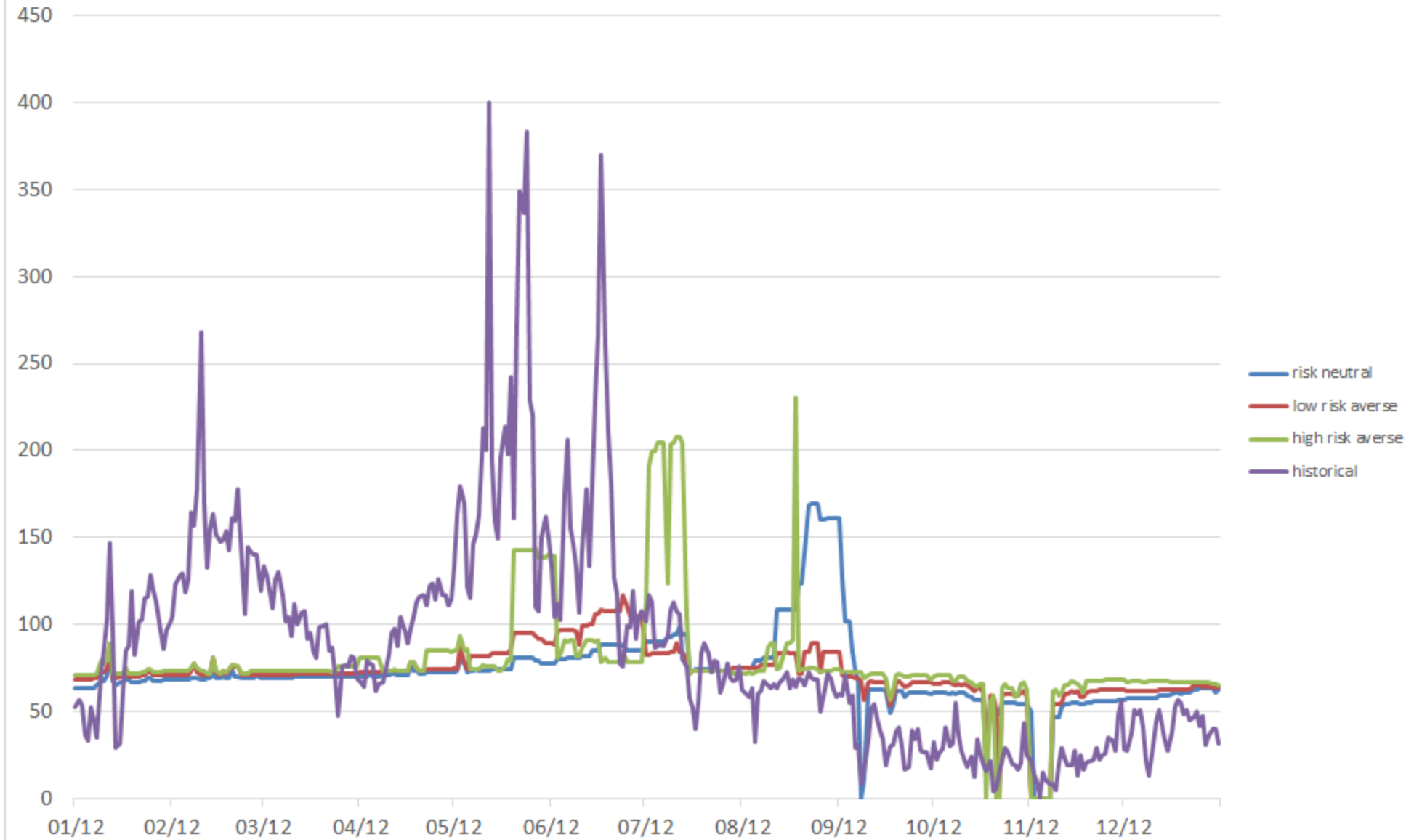


Time weighted average price of SI in 2011

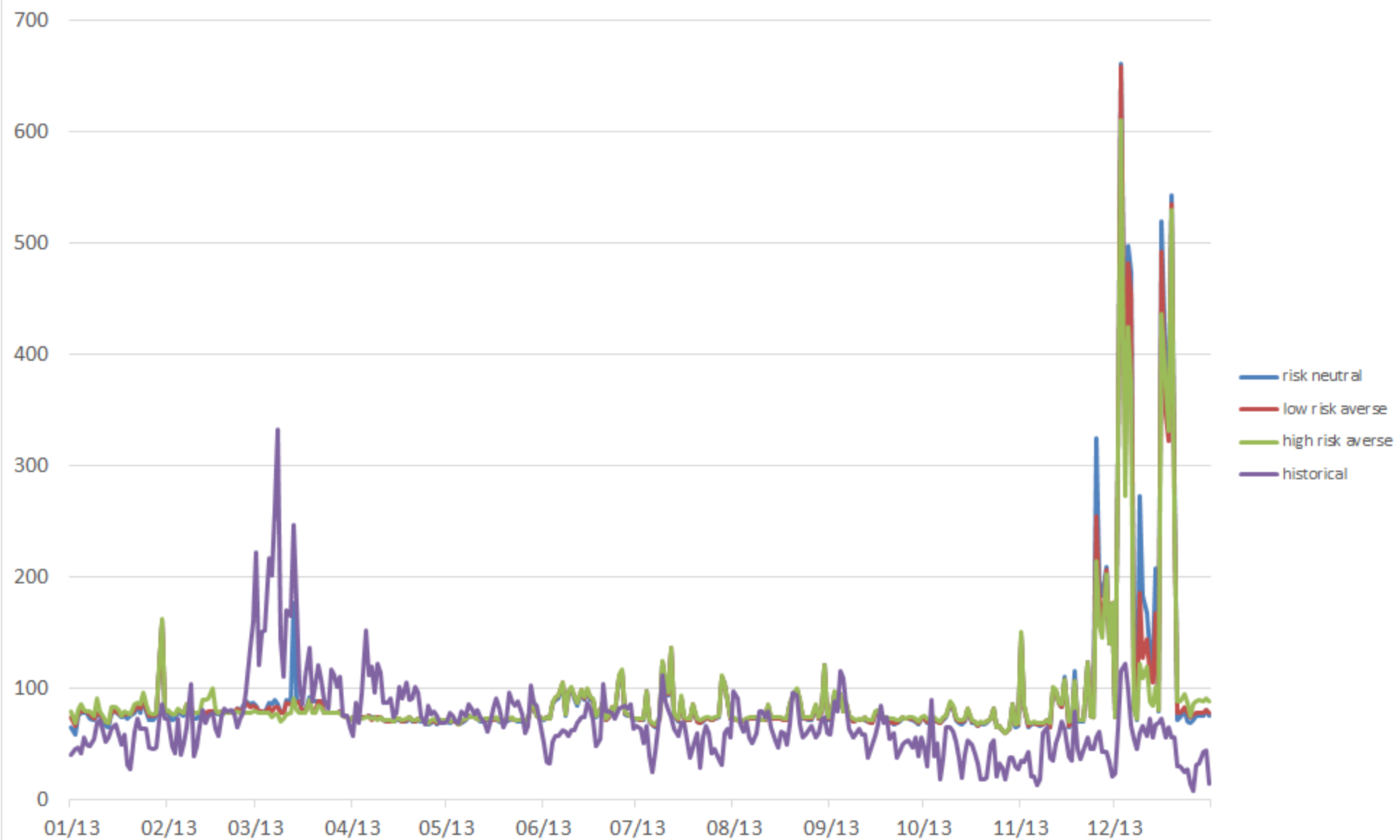




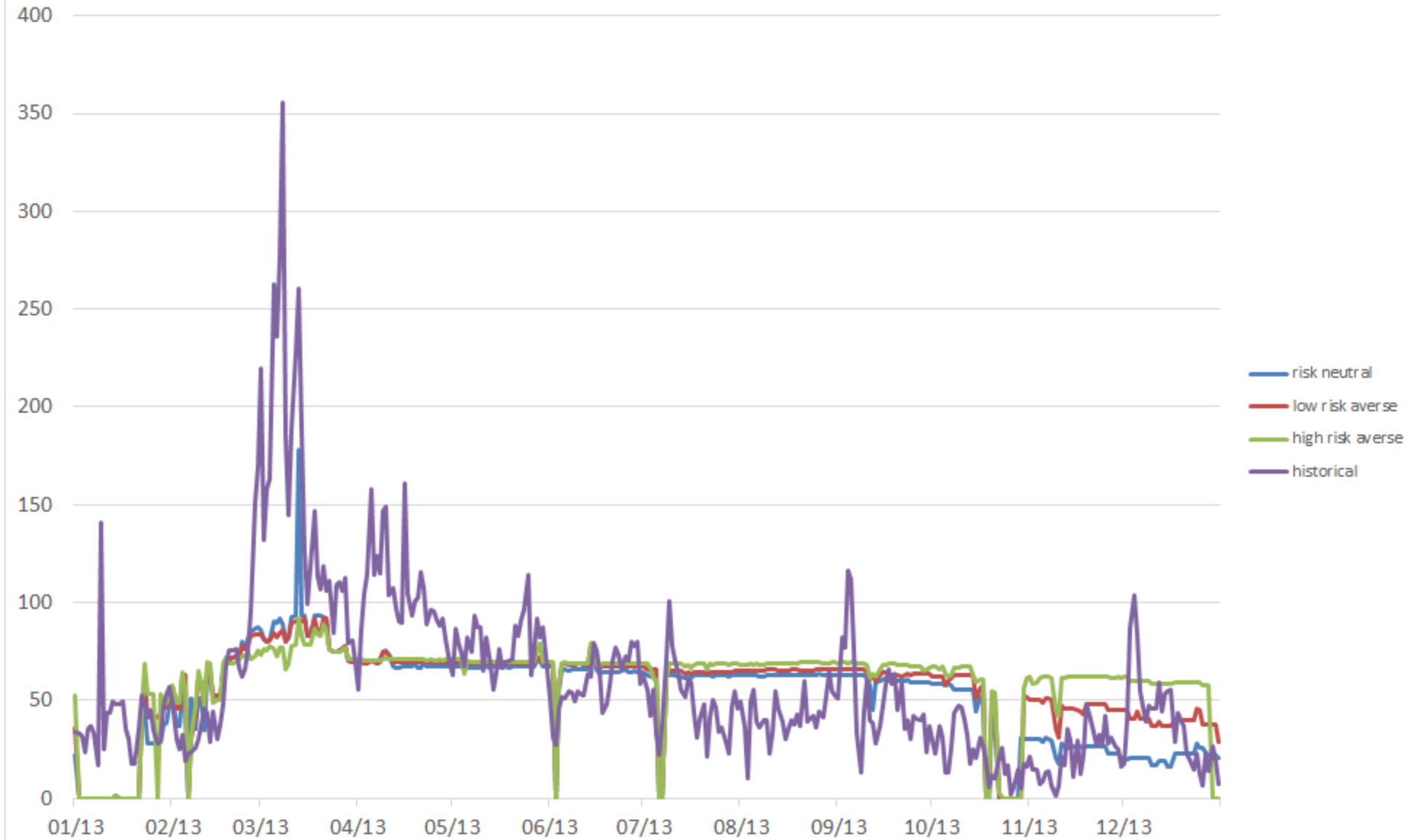
Time weighted average price of SI in 2012



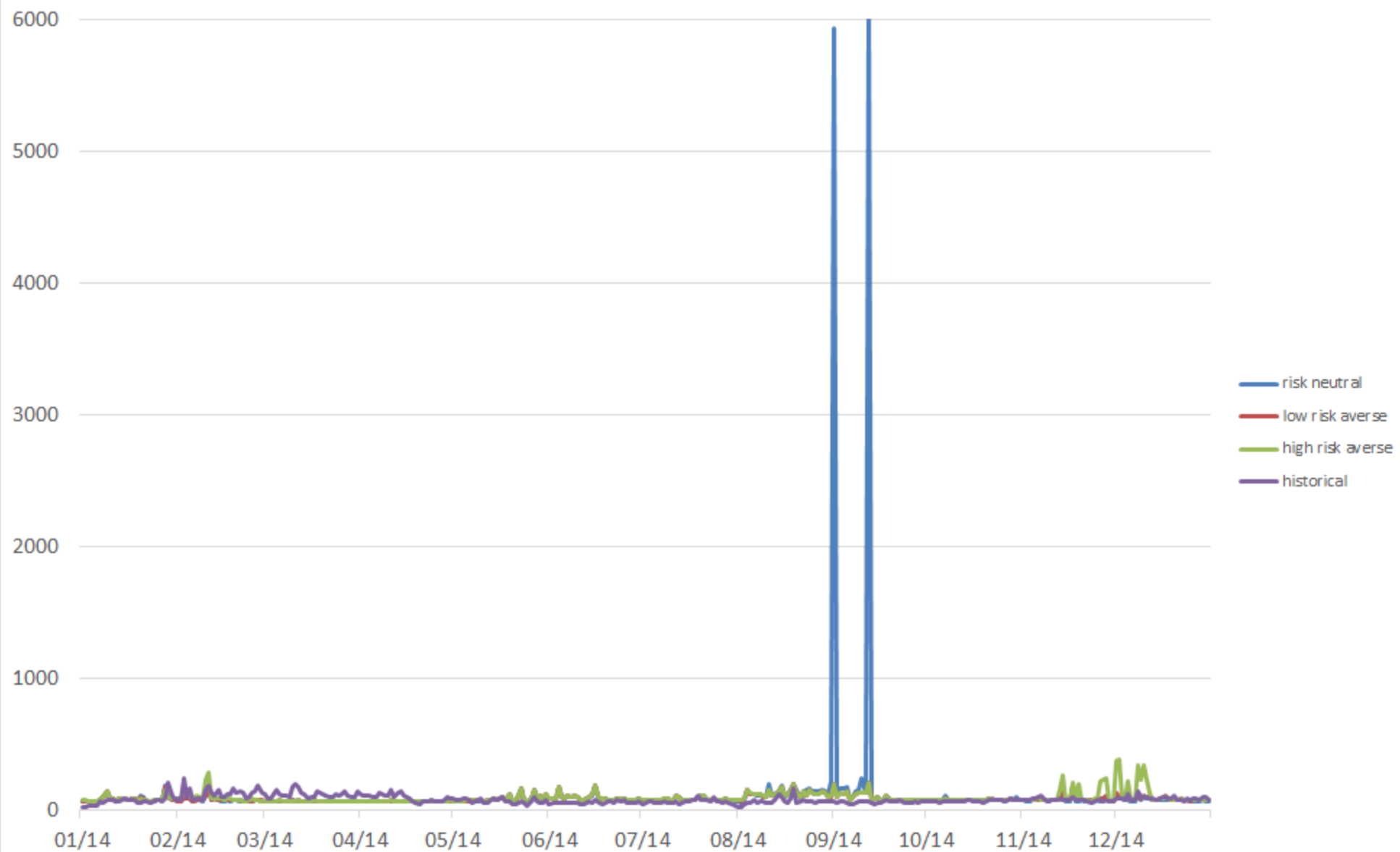
Time weighted average price of NI in 2013



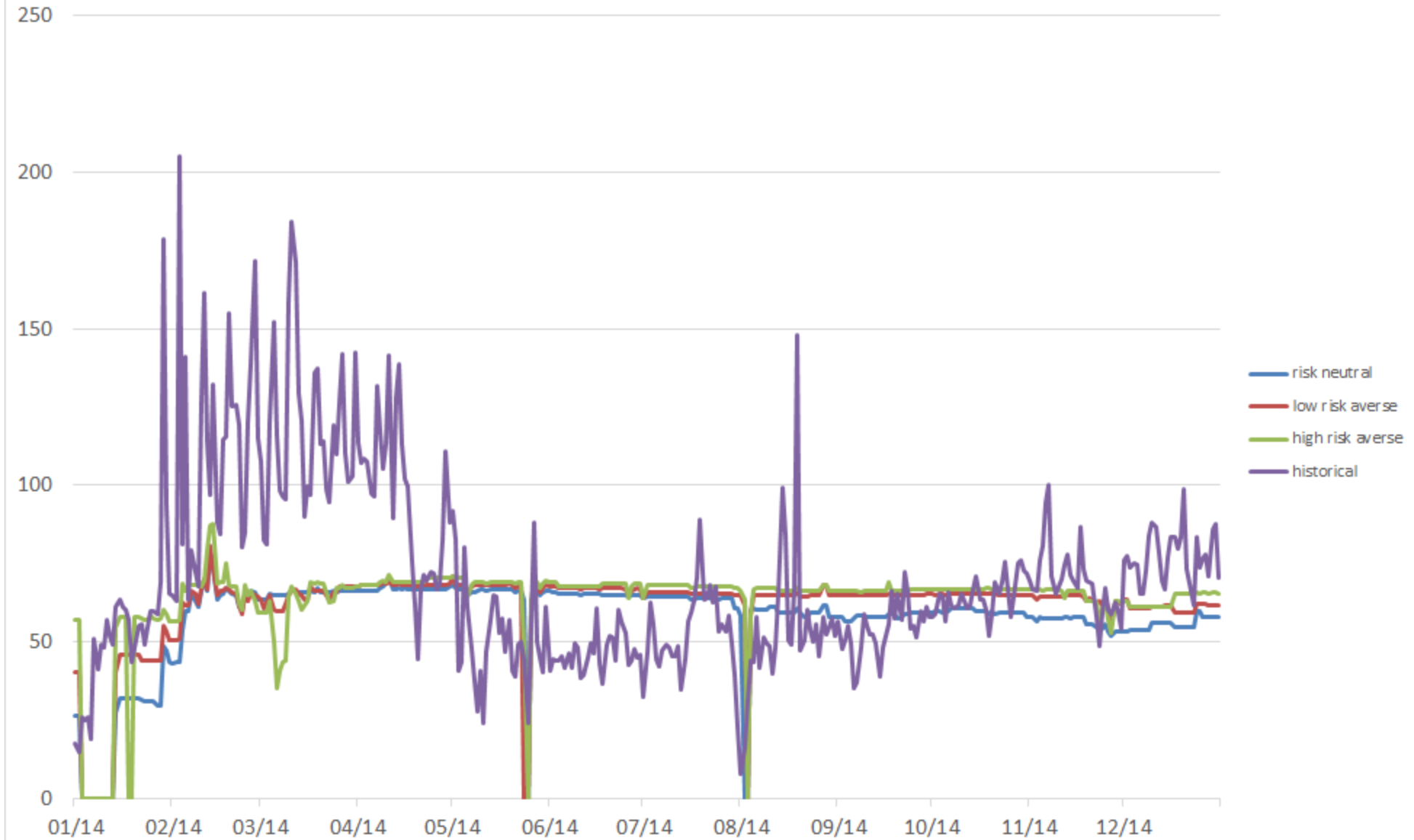
Time weighted average price of SI in 2013



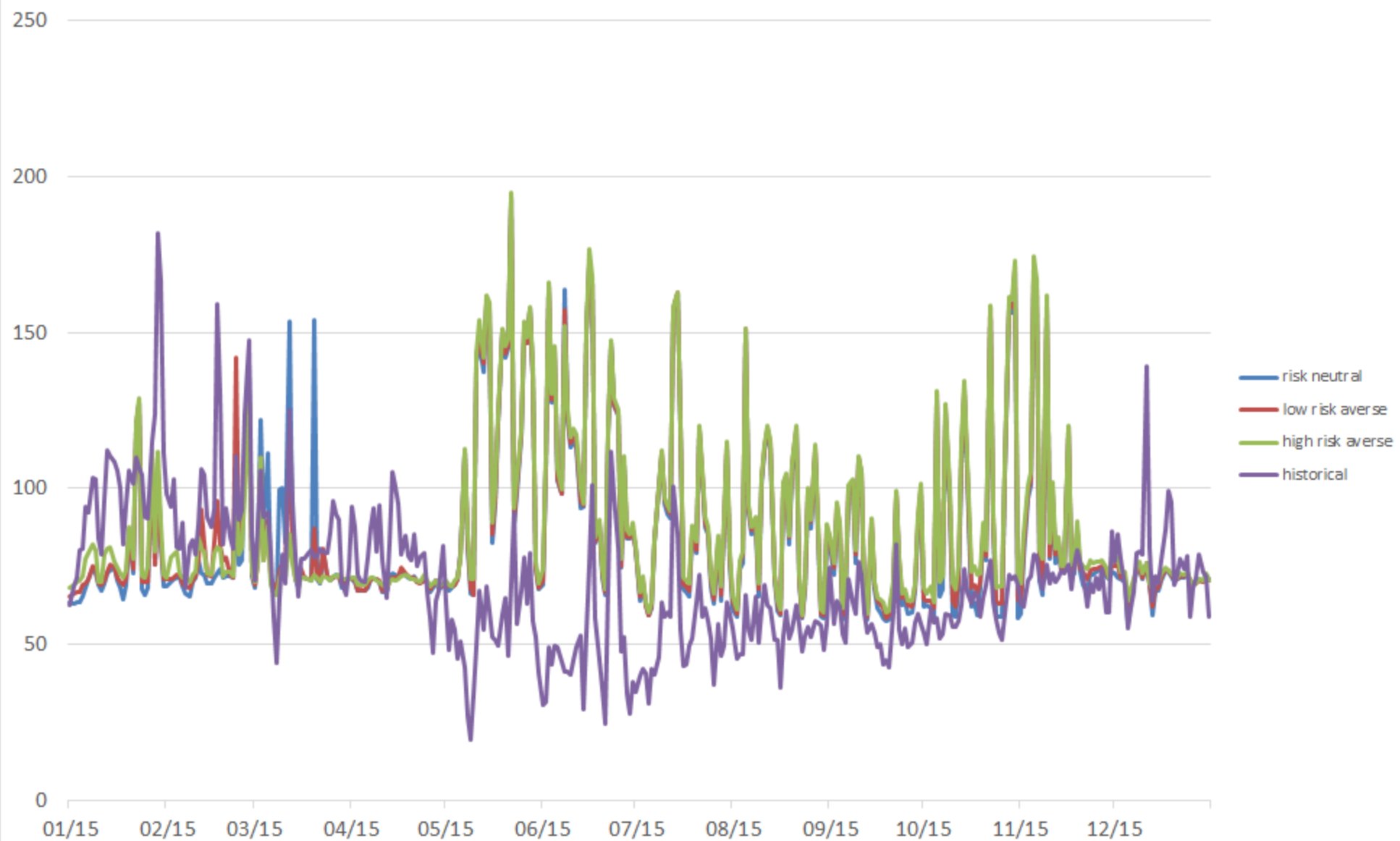
Time weighted average price of NI in 2014



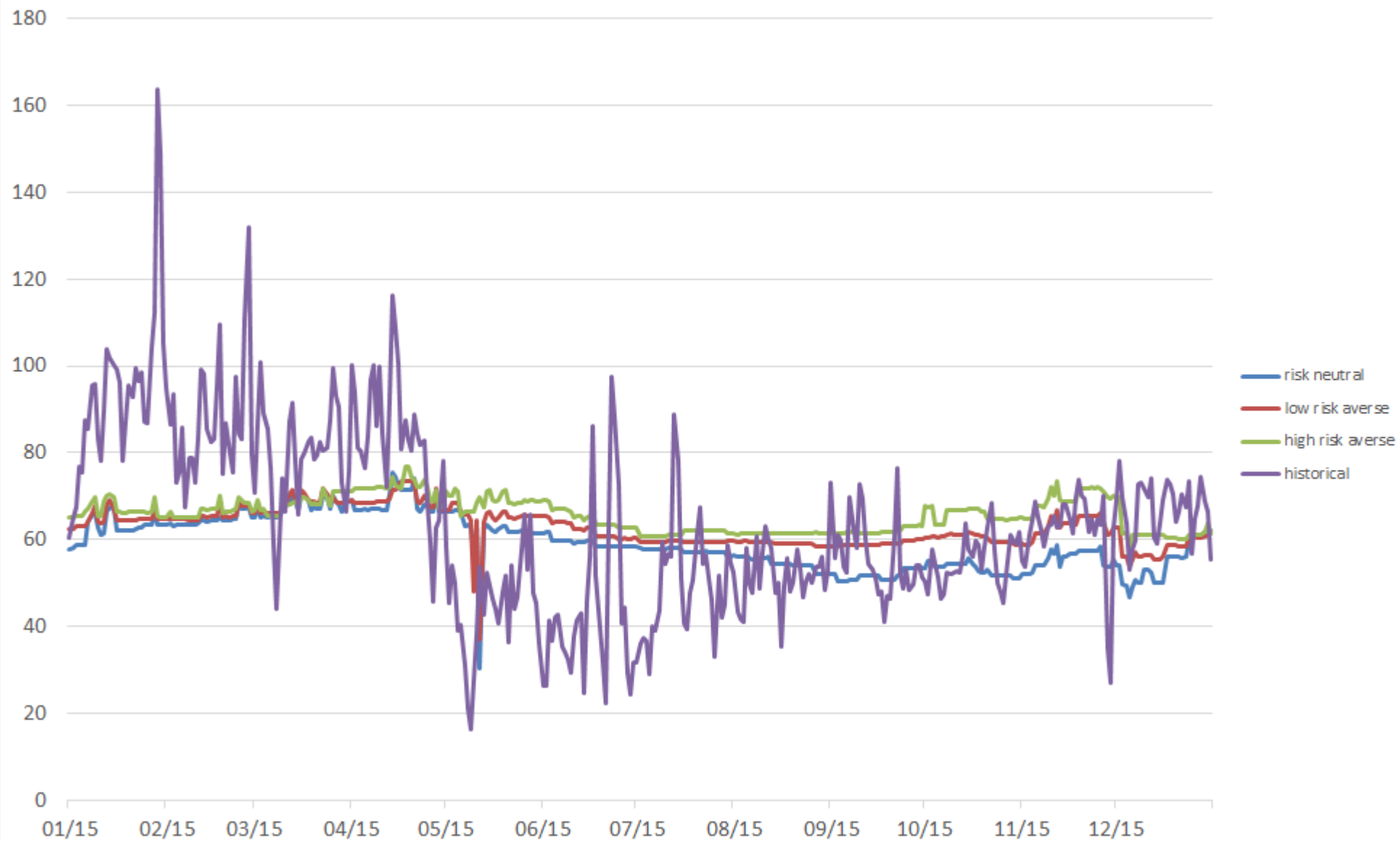
Time weighted average price of SI in 2014



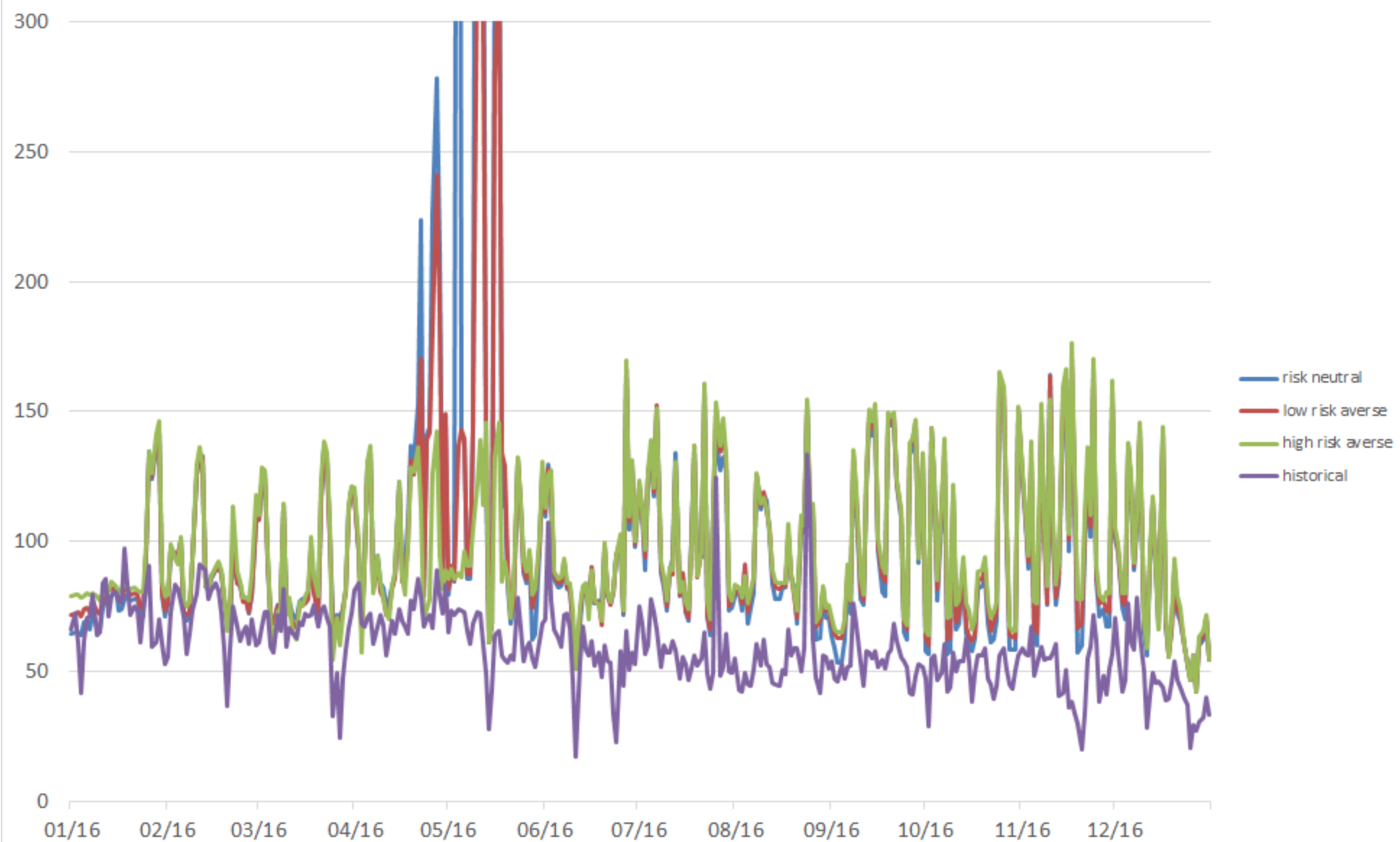
Time weighted average price of NI in 2015



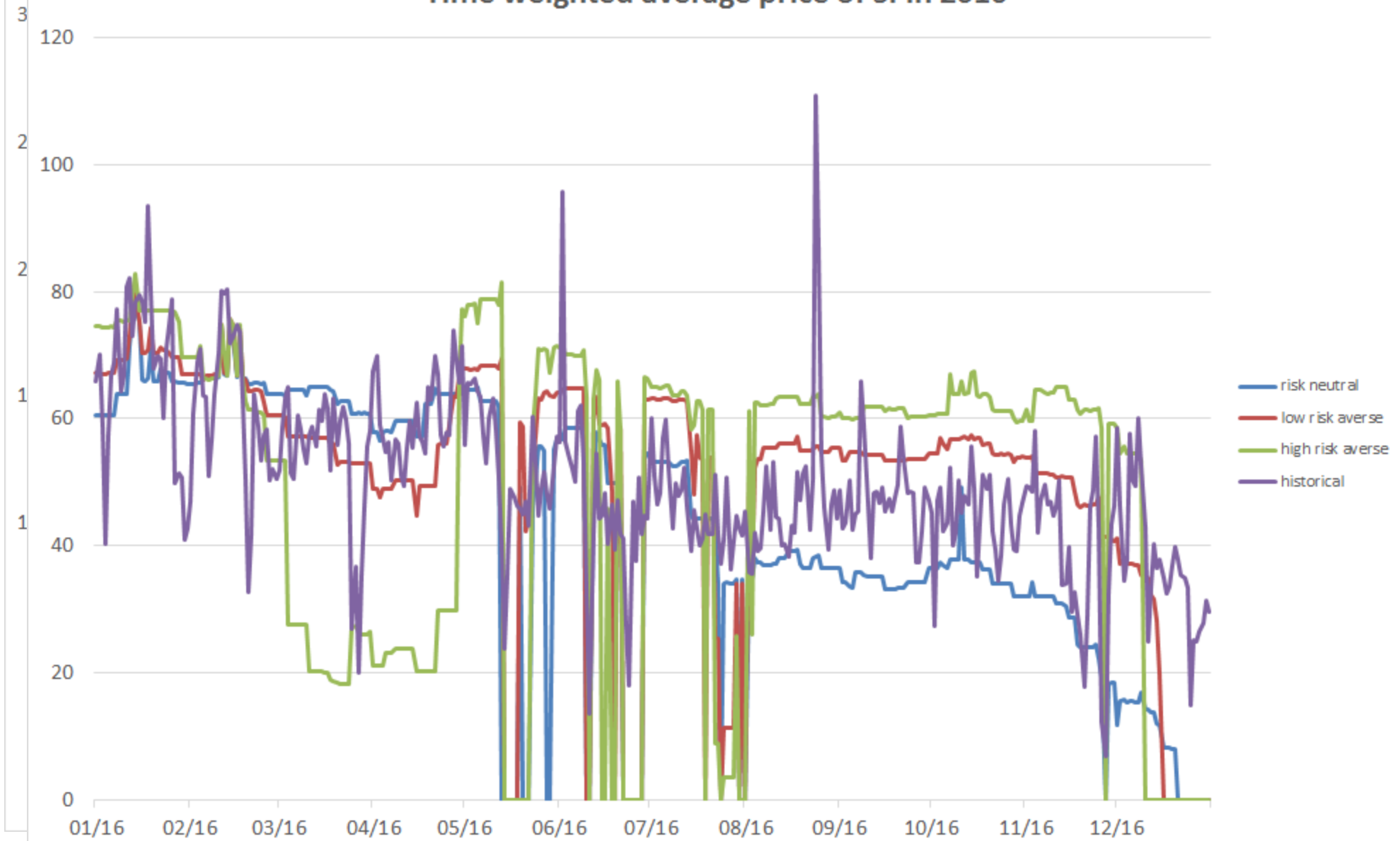
Time weighted average price of SI in 2015



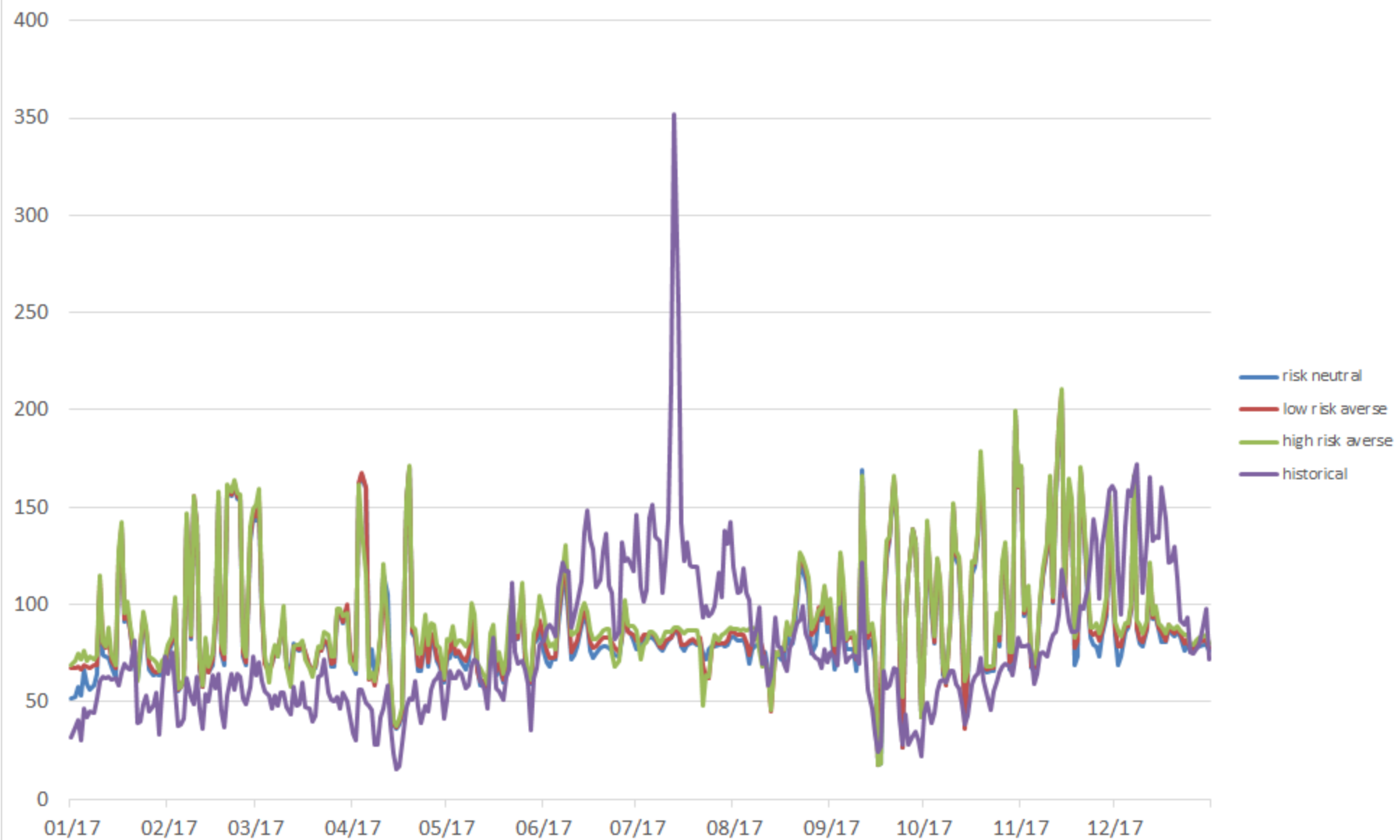
Time weighted average price of NI in 2016



Time weighted average price of SI in 2016



Time weighted average price of NI in 2017



Time weighted average price of SI in 2017

