X. OTHER APPLICATIONS, SUMMARY, AND CONCLUSION

A. Other Applications

The concepts presented here have applications to problems other than deconvolution. The preceding section on exponential gain estimation is a simple example. A similar procedure could be developed for estimating the exponential transformation (Equation (6-5)) proposed by Ooe and Ulrych (28).

Metha, a coworker, investigated the feasibility of estimating velocity by maximizing the non-Gaussianness of the migrated wavefield. His measure of non-Gaussianness required sorting the entire wavefield several times. This made the procedure very expensive. The measure U(X,2,1) could be used in the same application with tremendous savings in computation.

We have used norm ratios to modify Burg's maximum entropy algorithm (33). A simple change enables U(X,2,1) to be computed for the estimate of the forward reflectivity series. The reflection coefficients computed by the algorithm were accepted only if the measure of spikiness increased. This procedure retains some of the original color and yielded improved results.

Norm ratios can be used to evaluate any process that modifies seismic data. The quality of results from migration, stacking, deconvolution, and statics estimation may be quantified by spikiness. The setting of input parameters or choice of algorithm for any of these processes can be evaluated by testing their effects on the spikiness of the outputs.

B. Summary and Conclusions

The main purpose of this thesis was to explore the use of norm ratio methods for deconvolution. The generalized Gaussian family of probability distributions was chosen as a statistical model describing the observed seismograms and reflectivity series. A multichannel norm ratio was developed using statistical methods. The norm ratio was a measure of the likelihood of the estimated reflectivity series being described by one member of the family of distributions and not another.

It was assumed that the seismograms were more Gaussian and less spiky than the reflectivity series because of the averaging effects of the shot waveform and diffraction. Several algorithms were derived from the norm ratio. The algorithms estimated an inverse filter which maximized the likelihood that the estimated reflectivity series was spiky.

Several implementations for the algorithms were described and compared. The results obtained using those implementations on both synthetic and actual data indicate the method is a useful deconvolution procedure.